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International Union of Pure and Applied Chemistry

Global change and the role of governments

Sir Crispin Tickell

The following is the text of a plenary lecture presented by Sir Crispin Tickell at the CHEMRAWN VII World Conference on the Chemistry of the Atmosphere: Its Impact on Global Change which was held in Baltimore, USA, in December 1991. This and seven other plenary lectures are included in the recently published *CHEMRAWN VII Perspectives and Recommendations* (see Box, overleaf).

Sir Crispin Tickell is Warden of Green College, Oxford, UK, and former British Ambassador to the United Nations. He is a member of the CHEMRAWN VII Future Actions Committee.

Introduction

The twin problems of conferences of this kind are:

- how to formulate conclusions and recommendations in a way that people, businesses and governments can understand and act upon;
- how to convey such conclusions and recommendations to the policy-makers and decision-takers.

Scientists are not necessarily good at simplifying their thoughts, using plain language, abandoning shades and qualifications, or indeed committing themselves one way or another. Politicians and business leaders and others have their problems, too.

- They like clear and unambiguous advice;
- They operate on short time scales;
- Few of them understand science and its methodology: their mental structures are different;
- They have a lot of other things to think about.

The bridge between long-term science and short-term policies can be long and fragile. In some countries it scarcely exists at all. Scientific advisers do their best, but the cogs of the wheels do not always carry mesh.

The problem is still greater at the international level, which is usually one further move from reality:

- Different governments see things very differently;
- There is less of a common sense of interest;
- Agreement on common action is always difficult; no one wants to be put at a disadvantage by acting alone, particularly in environmental matters when pollution can all too easily pay.

So when scientists, people, governments and the international community are faced with the complexities of global change, their first need is for a common base, some fundamental ideas on which all can broadly agree. I will not pretend such a base yet exists. Yet we have something like one, at least in the international sphere, in the form of the report of the World Commission on Environment and Development, chaired by Gro Brundtland, Prime Minister of Norway, and published on 20 March 1987.

Sustainable development

The central idea of the Brundtland report was "sustainable development," defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs;" and development itself — a very elastic term — was described as involving "a progressive transformation of economy and society" for "the satisfaction of human needs and aspirations."

Of course these definitions raise more questions than give answers, but it would be unwise to dismiss them as word chopping or meaningless rhetoric. From them some key concepts emerged. Here are some I culled from a recent re-reading of the Report:

- the notion of intergenerational equity;
- the need to avoid endangering "the natural systems that support life on earth;" the atmosphere, the waters, the soils and the living beings;
- the ultimate limits to growth and the need to change its quality;
- the notion of a capital stock of resources (some of them non-renewable) which must be conserved and enhanced;
- global interdependence, and the need to define and promote the common interest;
- the need to ensure a stable level of population;
- the need to reorient technology and manage risk; and
- the need to merge "environment and economics in decision-making" at both the national and international level.

Problems

Let us stand back and look at the nature of the problems comprised in environment and development. Here are some simple points to give a sense of perspective:

1. In the last 2.5 million years, the earth has been in an ice age mode;
2. The last 10 000 years have seen all human civilization;
3. In the last 250 years the industrial revolution has changed the face of the planet. It is based on an unprecedented consumption of natural resources, especially fossil fuel;
4. The last 20 years have seen growing awareness of some of the consequences. This awareness was of course most eloquently expressed by the Brundtland Commission, and has since become widespread, even among those reluctant to admit the consequences.

What are the consequences? In the countries which pioneered the industrial revolution, there has been an amaz-

CHEMRAWN VII: Perspectives and recommendations

The World Conference on the Chemistry of the Atmosphere: Its Impact on Global Change was the 7th in the series of IUPAC sponsored conferences devoted to Chemical Research Applied to World Needs (CHEMRAWN). CHEMRAWN VII was held in Baltimore, Maryland, USA on 2–6 December 1991.

The findings and recommendations, edited by John W. Birks (Chairperson, CHEMRAWN VII Future Actions Committee) were published in the July 1992 issue of *Chemistry International* (Vol. **14**, pages 146–151). The complete volume of *CHEMRAWN VII Perspectives and Recommendations*, edited by John W. Birks, Jack G. Calvert and Robert E. Sievers, has now been published.

The volume includes an introduction by Sievers, the findings and recommendations and introductory remarks by Valentin A. Koptyug (IUPAC Past-President) and Sir John M. Thomas (Chairman of the CHEMRAWN Committee). It also contains the following conference plenary lectures:

- An approach to global climatic change: a U.S. perspective (D. Allan Bromley)
- Atmospheric chemistry and global change: the scientist's viewpoint (Daniel L. Albritton)
- Global environmental change overview: developing countries (A. P. Mitra)
- Control of global change: industrial view (E. P. Blanchard)
- Control of global climate alteration: power industry perspective (George M. Hidy)
- Future energy sources and the atmospheric challenges for research and development (Carl Heinrich Krauch)
- International cooperation and some research needs to improve our understanding of the chemistry of the atmosphere (Valentin A. Koptyug)
- Global change and the role of governments (Sir Crispin Tickell)

CHEMRAWN VII Perspectives and Recommendations *may be ordered from the Agency for International Development, Bureau for Science and Technology, Washington, DC 20523, USA. A limited number of copies is also available, upon request, from the Information Officer at the IUPAC Secretariat in Oxford.*

CHEMRAWN VII was held at the Stouffer Harborplace Hotel, Baltimore, USA. John W. Birks (below) is Chairperson of the CHEMRAWN VII Future Actions Committee.

The biosphere could support about 6 billion people if we all had a vegetarian diet and shared our food equally.

ing rise in living standards which the rest of the world now wishes to emulate. Economic wealth on a familiar definition rose at an almost incredible rate during most of this century.

The success of the industrial countries was founded on their ability to feed their growing populations. They each had an agricultural revolution before an industrial one. Others have not done so well. Total world population rose from 2 billion in 1930 to 5.3 billion now, and will rise again to over 8 billion in 2025. But the ability to feed this population is in doubt (more and more poor countries, for example, in Africa and Latin America, have to import food). The prospect of any substantial rise in living standards in countries without the resources and skills of industry must be illusory.

The carrying capacity of the earth is inevitably a relative if not subjective concept. But some recent calculations are of interest, and I quote from Norman Myers:

- If we all had a vegetarian diet and shared out food equally, the biosphere could comfortably support around 6 billion people;
- If 15% of our calories came from animal products (and again food were shared equally), the figure would come down to 4 billion people;
- If 25% of our calories came from animal products, then it would fall to 3 billion.
- And if 35% of our calories came from animal products, as in North America today, then it would fall to 2.5 billion.

So even if all sorts of improvements could be envisaged the prospect of a rise in human population to 6, 7, 8 billion and upwards is alarming indeed. Such a rise is more than a prospect. Even allowing for war, famine, and disease, the rate of increase — at present some 90 million more people every year — suggests that we are on the back of a tiger.

Repercussive effects of industrial revolution

We now have to look at the repercussive effects of the industrial revolution on land and land use; on fresh water; on industrial pollution; on the oceans; on the atmosphere, in particular acidification, ozone depletion, and global warming; and on other forms of life.

Can the industrial revolution be extended to the whole planet? If not, what is development for? What should be on the agenda for the Earth Summit?

Almost any forward look compels the conclusion that we cannot continue as we are, and that was fully recognized by the Brundtland Commission. We face not the end of Nature (the foolish title of a recent book), but a change in Nature, in many ways an acceleration of the processes of life. In looking to the future we must reckon with:

Our alarming degree of ignorance. We simply do not know enough about how the world works. Certainly one of the aims of this conference is to help find out. Much current science is about detail and the short term. Few even try to encompass the scene as a whole; they are often regarded with suspicion when they do.

The character of much change. We tend to see change as something gradual. But critical change is often abrupt. It proceeds by steps or thresholds instead of slopes. We bounce rather than progress from one apparently stable state to another, and the bouncing (and necessary readjustment) can be extremely painful for those around at the time.

The prospect of surprises. Most people feel that something will always happen to stave off disaster; but disasters have happened in the past, and will happen again. The discovery of ozone holes was entirely unexpected, a point made by the President's Science Adviser.

But ignorance and uncertainty are no excuse for not making the best judgements we can and taking action where necessary or possible. There are certain obvious catalysts which affect both the quality of human life, and life itself. The most obvious is the impact of population increase.

It would be pointless to try and work out all the consequences. But two stand out of particular importance. First we should expect a great increase in human displacements. In 1978 there were something like 5 million refugees in the world on a narrow political definition. I believe there are now more than 17 million. If we add in some 10 million environmental refugees or economic migrants, it means that at present there are around 25 million refugees worldwide. With disruption of current patterns of life, that number would increase dramatically. Sea-level rise would have particularly big effects. It is not fanciful to estimate that with world population rising to 8 billion or more, the refugee rate could rise proportionately with alarming consequences for the integrity of human society as a whole.

Schoolchildren being tested for schistosomiasis: we could see the spread of diseases we had thought under control or far away. ***(WHO Photo by Kenneth E. Mott)***

There would also be more direct risks to human health with changes in existing patterns of disease. Temperature and moisture are both critical to the ability of viruses, bacteria and insects to multiply. Thus we could see the spread of diseases we had thought under control or far away. Nor should we forget that with loss of biodiversity, it will be less easy to tap the natural world for the constituents of drugs to cope with changes in bacterial and viral populations.

Better management of our planet

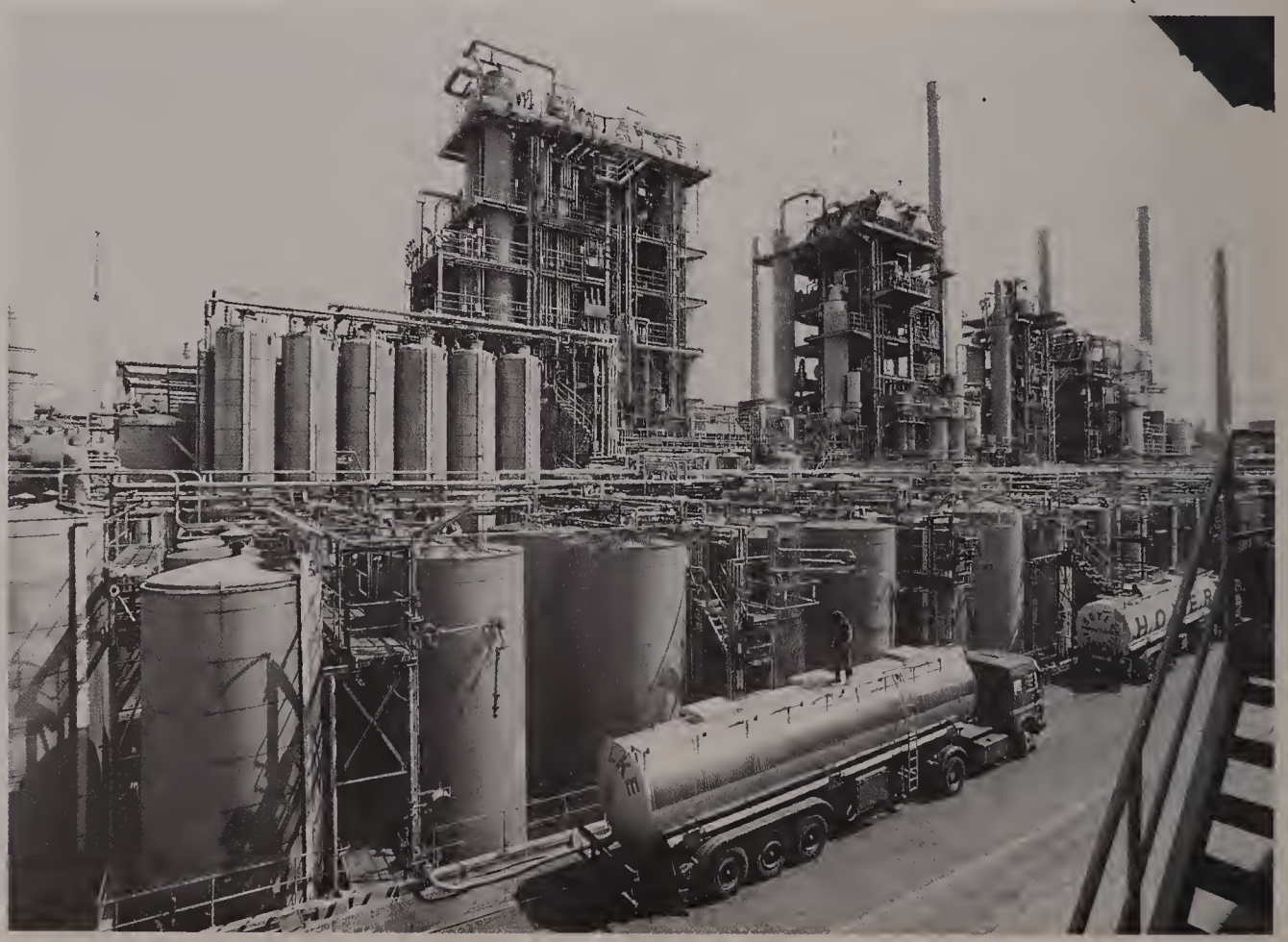
After this visit to the Chamber of Horrors, you may well wonder why the governments and peoples of the world are not concerting action to meet an unprecedented range of problems. The answer is that they are trying to do so. The agenda for the Earth Summit includes an Earth Charter; conventions, agreements or protocols on climate change, biodiversity, and forestry; and an Agenda 21 to set out a list of actions necessary in the next century.

But of course these raise wide issues reading into the better management of our planet. In order to give discussion some precision, I mention four issues which came up at a meeting of the Aspen Institute which I chaired last July:

1. The question of institutions and instruments:
   - technical ones already exist: for example, the United Nations Environment Program, the World Bank, the World Meteorological Organization and the World Climate Program;
   - then there are the central organs of the United Nations: the General Assembly, the Security Council, and the International Court of Justice;
   - but we may have to consider something new: for example an Ecological Security Council; a Commission for Sustainable Development; or a series of GATT-type mechanisms arising from the specific conventions.
2. The question of finance: we need to make better use of existing resources, but also look at something new (e.g., Global Environmental Facility, and Multilateral Fund under the Montreal Protocol);
3. The question of legal issues with the possibility of major development of international environmental law;
4. The question of technology and how best to transfer and diffuse it.

Unfortunately, the preparations for this Conference are not going well. As I said at the beginning, countries do see these problems very differently. In a way, "environment" has been captioned by the industrial countries, and "development" by the non-industrial ones, and each is talking a different language. Polarization has followed, and the sad old rhetoric of the 1970s has revived. Why? In my view the main reasons are:

A. The industrial countries tend to think of the problem as one which involves them much less than the rest of the world.



Consumption patterns of industrial countries are a root cause of some of our global problems.

Allan Bromley being interviewed at CHEMRAWN VII. Bromley is Assistant to the President for Science and Technology, Office of Science and Technology Policy, Washington, D.C., USA. His lecture 'An approach to global climate change: a U.S. persective' appears in the *CHEMRAWN VII Perspectives and Recommendations*.

In fact,

1. they are directly or indirectly (and however unwittingly) responsible for the mess (for example, 70% of carbon emissions, 23% from the United States alone);
2. their consumption patterns are a root cause, and so far they are unchanged. Such patterns are of course an example that other countries wish to follow;
3. by not giving an example of restraint but continuing to preach it to others, they lack credibility;
4. they are as guilty as anyone in continuing to use economic instruments and methods of thought that fail to take account of the environmental dimension.

B. For their part, the non-industrial and other countries believe — in my view wrongly — that they have the industrial countries over a barrel; somehow they see a bargain in which they trade some measure of environmental restraint against massive quantities of aid, debt forgiveness, new terms of trade, etc. They too are guilty, although more forgivably, for using outdated economic analysis and policies. Many still see the concern in industrial countries about the environment as a trap to slow their development, and keep them in subservient poverty.

I am afraid that both sets of countries nourish illusions. Environment concerns them all, and so does development. They have yet to understand the gravity of the problem. The interests they share are vastly greater than those which divide them. Most important, environmental change will affect all, but be more damaging to poor countries than to rich ones. They are supremely vulnerable.

By contrast, most of the industrial countries should be able to manage over time. But they could scarcely prosper in an impoverished world when they would be a shrinking proportion of the population and where they would be vulnerable to invasion, infiltration and the growing pollution of others. This was an essential point in the NAS Panel on the Policy Implications of Greenhouse Warming to which Dr. Bromley referred. In fact, wealth and poverty cannot sit together for long. Yet the gap between rich and poor is ever widening. According to Swaminathan:

- in 1880, the ratio of real per capita income between Europe on one hand and China or India on the other was 2:1;
- by 1965 the ratio was 40:1;
- in 1991 it was 70:1.

Thus all need a new international regime. But those who need it most are the poor. They should be the leaders rather than the laggards.

Thinking differently

In relation to the size and scope of the issues, we have hardly started to cope with them. We need not only to behave differently but to think differently:

- We need to recast our vocabulary. Words are not only a means of expression but also the building blocks of thought. The instruments of economic analysis are blunt and rusty. Such words as "growth," "development," "cost benefit analysis," even "gross national product," are used in such a misleading way that they are more than ripe for redefinition;
- We need to realize that conventional wisdom is sometimes a contradiction in terms.
- We need to change the culture. Many have lamented the division between the cultures of science and the arts. They are right to do so. But neither is now in charge. Our real bosses are the business managers. Their calculations are strictly short term.
- We need to recast parts of our educational systems to promote better understanding of the environment. In some countries this has begun already, and in others it was always there. In general, I have found the young more in tune with nature than their teachers.
- We need a value system which enshrines the principle of sustainability over generations. Here the Brundtland report has made a beginning. But we have far to go. The proposed Earth Charter for the Summit next year is the first test.

By comparison, behaving differently is almost easy. It follows naturally from thinking differently. Little is possible without a vigorous public opinion putting pressure on local authorities and governments. But the governments themselves are best placed to exercise leadership. There are five main areas for action: over people, over generation and use of energy, over use of land, over industry and over biodiversity or other forms of life.

For governments a measure of internal reorganization is necessary: for example, there should be tight coordination at the centre to ensure integration of policies; environmental audit within Departments, and environmental accounting in annual budgets; environmental costing and pricing with full social cost taken into account; and use of fiscal incentives and disincentives.

Governments should re-target and give more financial support to relevant scientific research and coordinate results.

Five principles

All this would amount to a refashioning of our society. But the prospect need not stun us into inaction. I suggest five principles on which governments should act, singly and together.

1. They should now do what makes sense for reasons other than any one environmental factor: the so-called "no regrets" policies.
2. They should take out insurance policies against disaster, and pay the necessary premiums in terms of precautionary investment.
3. They should re-target and give more financial support to relevant scientific research and coordinate the results.
4. They should work out an international strategy which recognizes the realities, sets the framework for collective action, takes good account of equity, and above all is founded on national as well as international interest.
5. They should deal with environmental issues together. Isolated measures to cope with one of them can sometimes make others worse.

I have left the two most difficult points to grasp to the end:

A. We forget that human societies are inherently fragile: not just that of the Soviet Union but in Africa and elsewhere. We do not want to suffer the fate of preceding civilizations.

B. We are hooked on the idea of progress, the thought that whatever the setbacks or deviations, human beings advance upwards and onwards. Hence our engrained feeling that problems can always be solved, resources should be exploited to the full, dynamism is better than stability. Certainly this has been a most powerful energizer. Yet in the longer term this philosophy requires at least modification. Sustainability — or sustainable development — carries the implication of balance with nature over an indefinite number of generations. Thus animal species, including our own, and the ecosystems of which they are part, must eventually achieve a stability in which population and resources are in broad equilibrium. Malthus may have got his methodology wrong but his insights were right. Steady-state societies have a tendency to atrophy. Rather we need a steadier state in which our species can accommodate change instead of being endangered, damaged or destroyed by it. Only thus can we come to terms with the realities of our planet.

Centenary of Geneva Conference

'Organic Chemistry: Its Language and Its State of the Art' was the theme of the Centenary of Geneva Conference held at the University of Geneva, on 22–24 April 1992. Speakers included Nobel Prize winners Vladimir Prelog and Jean-Marie Lehn.

Introduction

The first 'Geneva Conference' was convened in April 1892 in response to the internationally acknowledged need for a clear and unambiguous nomenclature related to chemical communication.

The approach used in formulating the first small set of rules has continued to be the basis for successive revisions and of the ever-increasing extension of the rules. The international centennial meeting, which was co-sponsored by the Swiss Chemical Society, the Association of Swiss Chemists, The Division of History of Chemistry of the American Chemical Society and IUPAC, commemorated the first conference and examined the history, diversity and state-of-the-art of organic chemistry.

A special 'Centenary Volume' of the symposium papers will be published by *Verlag Helvetica Chimica Acta*.

The following report is largely based on the abstracts of the 14 lectures presented at the conference.

The 1st Geneva Conference

The opening session of the Centenary Conference took place on the afternoon of Wednesday 22 April. Prof. Heinrich Zollinger, IUPAC President 1979–81, was the official representative of the Union and addressed participants during this session.

The first lecture, entitled 'Organic nomenclature: the Geneva Conference and the following 50 years' was presented by James Traynham (Louisiana State University, USA). He pointed out that some of the agreements reached at the 1st international conference on chemical nomenclature live on in the current rules of nomenclature of organic chemistry, but some others did not last.

His paper summarized the circumstances that led to that conference, its achievements, and the extensions and revisions of its framework of resolutions during the following 50 years. This history illuminates, stated Traynham, not only how the rules for organic chemical nomenclature have been developed but also the striking parallel with the dynamic nature of other work in chemistry.

Forty years of ferrocene

Following Traynham's paper, Jack Dunitz (ETH-Zentrum, Zürich) spoke about 'Forty years of ferrocene'. He pointed out that the sandwich structure of ferrocene and other metallocenes is just about 40 years old.

The early crystal structure studies of ferrocene led to a centro-symmetric molecular structure with parallel, staggered rings (molecular symmetry D_{5d}). We now know that this conclusion, based on space group symmetry considerations, is incorrect; the monoclinic room-temperature crystal structure is disordered. Ferrocene is polymorphic.

Registration desk (left) at the Commemorative Symposium held at the Université de Genève, Uni Dufour (above). General view of Geneva and Lake Geneva (top left).

From left: Ernst Peter Kündig (Organizing Committee); Jack Stocker (CNOC), whose badge reads: 'BE HUMBLE — Most of you is empty space between electrons, and 85% of the rest is water!' ; Heinrich Zollinger (IUPAC Past President); Volkan Kisakürek (Organizing Committee).

On cooling the room-temperature crystal form below 164 K, it undergoes a phase transition to an ordered (more or less) triclinic form containing molecules in which the rings are neither staggered nor eclipsed but in an intermediate orientation (molecular symmetry D_5). Below about 250 K the thermodynamically stable form is orthorhombic (isostructural with ruthenocene) and contains molecules with exactly eclipsed rings (molecular symmetry D_{5h}). The other metallocenes seem to adopt only one crystal modification. Dunitz discussed possible reasons why ferrocene behaves so differently from the other metallocenes.

The final lecture of the afternoon session was delivered by Louis Hegedus (Colorado State University, USA). The title was 'Synthesis of new heterocyclic systems by photochemical reactions of chromium carbene complexes with imidazolines.' He explained that the photochemical reaction of chromium carbene complexes with imidazolines produced azapenams. Catalytic hydrogenation of these under acidic conditions produced perhydrodiazepinones. Acid catalysed ring opening produced unsaturated dioxocyclams which were readily reduced to dioxocyclams.

Personal observations

The first lecture in the Thursday morning session was presented by Kurt Loening, Past Chairman of the IUPAC Interdivisional Committee on Nomenclature and Symbols. His lecture title was 'Organic nomenclature: the Geneva Conference and the next 50 years; some personal observations'.

Loening pointed out that the evolution of organic nomenclature was interrupted by World War II but resumed in 1947. He reviewed the development from that time to the present not only from a historical perspective, but also from a personal point of view, since he was active in this field during much of this period.

Nobel Prize winner Vladimir Prelog then delivered an amusing lecture describing his 'nomenclature' years. These involved a somewhat fleeting involvement with IUPAC in the early 1950s. Prelog, like several other lecturers, made substantial references to the contributions of Pieter Verkade and his book *A History of the Nomenclature of Organic Chemistry* (see *Chem. Intl.* **8**, 27–29 (1986)). Verkade was President of the Organic Chemistry Division (1955–59) and Chairman of the Commission on Nomenclature of Organic Chemistry (CNOC) for 37 years (1934–71)!

The Thursday morning session ended with a lecture by Volkan Kisakürek, Chairman of the Organizing Committee and Editor of *Helvetica Chimica Acta*. He spoke about 'Chemistry journals and nomenclature' and suggested that the title of his contribution justifiably represented and implied a long-term co-existence of nomenclature and chemistry journals and their authors. The journals and their authors, on one hand, always needed a nomenclature to tell a chemical story. On the other hand, formal nomenclature systems of any kind could and can only be introduced, disseminated, established, and sometimes abandoned through publications in chemistry.

This everlasting mutual interest was not always accompanied by a mutual sympathy said Kisakürek. Nowadays, the typical attitude of most of the publishing chemists towards nomenclature requirements of journals can be defined as: 'I am only interested in doing chemistry and not in naming it.' Editors of the chemistry journals, on the other hand, consider correct nomenclature as a substantial component of their *raison d'être* and accordingly tend to dictate, claiming: 'If you are willing to tell a chemical story, choose the appropriate language' or, in other words: 'If you produce something, try to name it correctly.'

The language of organic chemistry

The first lecture in the Thursday afternoon session was presented by Nobel Prize winner Jean-Marie Lehn (Strasbourg, France). He spoke about 'The concepts and language of supramolecular chemistry.' According to Lehn, the language of chemistry describes a tangible reality. It is a 'reification' of the word and the text. Its signs are engraved into matter.

The emergence of the concepts of supramolecular chemistry has led to the introduction of new terms or to the reappropriation of old ones, describing either classes of compounds or types of functions. It has also involved a shift in approach from strategies towards structures to strategies towards properties. As the field affirmed itself, the way from molecular to supramolecular chemistry brought about a change in objects and goals from structures and properties towards systems and functions. Lehn illustrated these considerations with specific examples taken mainly from his own work. He stressed the relationship between chemistry and art.

James Traynham (left) and Vladimir Prelog present their lectures.

In the next lecture, Marjorie Caserio (University of California, USA) asked how is it possible for students to learn and retain an understanding of the sujbect when there are well over 10 million compounds in the arsenal of organic chemistry. In her lecture on 'The importance of language in the teaching of organic chemistry' she emphasized that ease of learning depends on good communication, and, to communicate effectively, chemists have had to devise a special language to reveal chemical structure, chemical relationships and chemical behaviour.

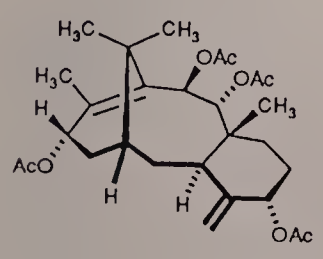
The language of chemistry has more terms than any other scientific discipline yet is said to be better ordered. This is no accident and stems from past and present efforts to make the language of organic chemistry clear, useful, rational, systematic, practical and acceptable to an international community.

How teachable is this language, asked Caserio, and how well is it accepted and assimulated by students having little prior knowlege of the subject? Her paper focused on this question and traced how the language and its impact on the teaching of organic chemistry have changed since the Geneva Conference of 1892.

Taxol

Leo Paquette (The Ohio State University, USA) lectured on 'Synthetic progress towards the powerfully cytotoxic taxol and related taxane diterpenes'. He pointed out that the structurally complex, biologically active taxanes fall into two broadly definable classes.

The first, exemplied by taxusin (1), features a C-H bond at the non-olefinic bridgehead position. Characteristic of the second group, of which taxol (2) is a member, is a hydroxyl substituent at this site.



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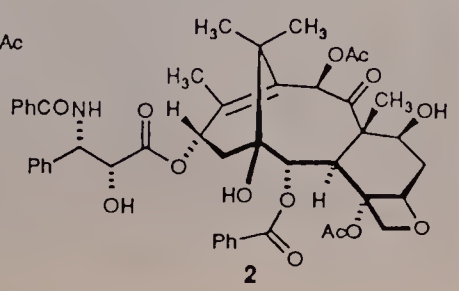

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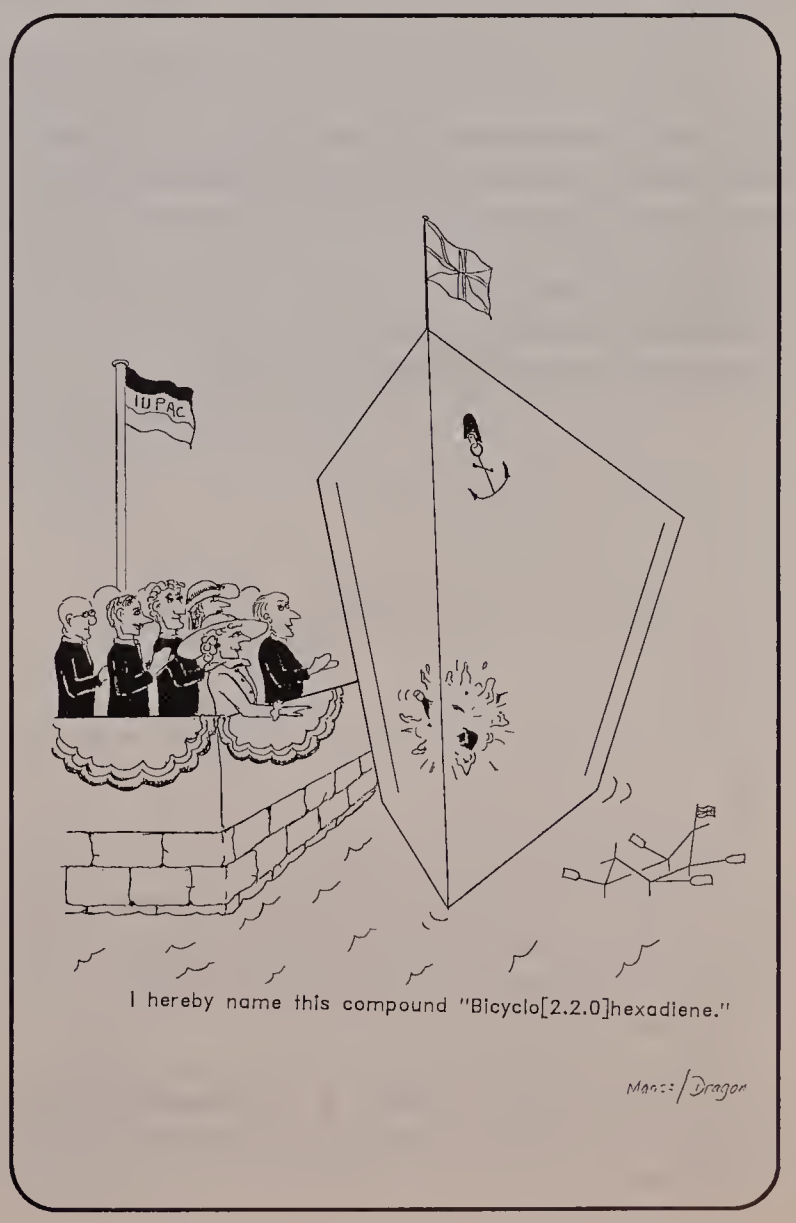
Paquette described synthetic methodology capable of accomplishing these twin objectives in a complementary and enantioselective manner. He also explained the importance of substituent control of atropisomerism, as well as computational and crystallographic analysis, to progress towards these synthetic objectives.

Chemical nomenclature in the government laboratory

The final lecture of the day was given by CNOC Secretary Ted Godly. The topic was 'Chemical nomenclature in the government laboratory'.



His lecture included an account of the development of the Nomenclature Division at the Laboratory of the Government Chemistry (LGC) in London, UK, and of its various functions as an authoritative governmental advisory service on chemical nomenclature, and in particular its relationship to IUPAC Rules of Nomenclature and the appropriate IUPAC Commissions.

Godly reviewed relationships between formulae, structures, names and line-notations and examined the development of machine-handling with particular reference to collaborative studies at research schools in UK universities sponsored by LGC.

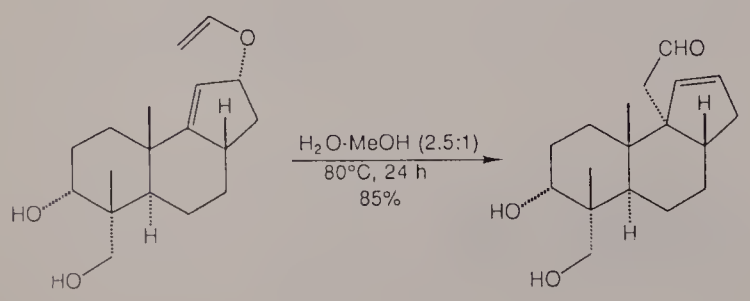
He then outlined current CNOC interest in unique name generation and the possible direction of this future activity against the background of the historical controversy at the 1892 Geneva Conference, that is: 'systematicity *versus* maximum utility' taking due account of the new factor of computerization of structure-handling and chemical naming.

Unconventional solvents

The final session, on Friday morning, featured three lectures. The first, by Paul A. Grieco (Indiana University, USA) considered organic chemistry in unconventional solvents and specifically lithium perchlorate in diethyl ether.

Grieco reminded the audience that solvent effects can have a profound influence on organic reactivity. It was over 10 years ago, he said, that it was demonstrated that water can dramatically accelerate Diels-Alder reactions despite the general consensus, at the time, that Diels-Alder reactions are essentially independent of solvent polarity.

During the Indiana study on aqueous Diels-Alder reactions, Grieco's team became intrigued with the idea of promoting Claisen rearrangements in water. They had previously shown that water also has an accelerating influence on the Claisen rearrangement. Whereas the vinyl ethers of cyclic allylic alcohols are most reluctant to undergo the [3,3]-sigmatropic rearrangement in the gas phase or in hydrocarbon solvent, remarkably, ally vinyl ether (3), for example, rearranges in water at 80°C in excellent yield:



3

The accelerating influence of water as a solvent on the rate of the Claisen rearrangement has been demonstrated on a number of substrates, which clearly illustrates, said Grieco, the potential it holds for those engaged in the synthesis of natural and unnatural products.

Grieco then described work on lithium perchlorate in diethyl ether which, he stated, is a unique medium for accelerating the [1,3]-sigmatropic rearrangement of allyl vinyl ethers.

'A man with one watch knows what time it is; a man with two watches is never sure' according to a proverb quoted by Janusz Wisniewski (Beilstein Institute, Frankfurt, Germany) who is seen here demonstrating AUTONOM — a system for computer translation of structural diagrams into IUPAC-compatible names. Wisniewski contributed the cartoon.

The future

Following Grieco's lecture, Wolfgan Oppolzer (Université de Genève, Switzerland) outlined recent progress in asymmetric syntheses using chiral substituents, reagents and catalysts. Finally, Jack Stocker, an Associate Member of CNOC, pointed to the future in a lecture entitled 'Tomorrow's organic nomenclature: the next 50 years.'

Stocker suggested that the future of organic nomenclature will be considered to lie in some combination of the following three projections:

1. A continuation of the activities of the past 100 years, involving 'housekeeping', 'policing', developing new nomenclature (e.g. 'phanes'), and the particular current focus on an uniquely preferred name for each structure.

2. Coming to grips with the awesome potentialities of the computer to access a multiplicity of databases via electronic highways. After it becomes routine to send a structure on a coded form to a 'fax' number and receive back almost immediately a preferred name 85-90% of the time, the Commission (CNOC) clearly will have to redirect its energies. Stocker considered various options.

3. The *consequences* of (2) above are perhaps the most important points to be addressed. Will the future nomenclature expert be so specialized that he is no longer accessible to his non-specialist colleagues? Who will train him? — asked Stocker. Will the increasing complexity of the field so alienate its users that they employ it with even less rigour and therefore further abuse it? Can or should CNOC consider these concerns?

Organic synthesis

Strategies and reagents for stereocontrol in synthesis, advances in asymmetric synthesis and biomolecules in organic synthesis were the themes of ICOS 92 held in Montréal between 28 June and 2 July last year.

Introduction

The 9th International Conference on Organic Synthesis (ICOS 92) was held at the Université du Québec à Montréal (UQAM), Canada, on 28 June–2 July 1992. The scientific programme consisted of plenary and invited lectures, poster sessions and contributed papers chosen among the contributed works submitted for the poster sessions. Over 1000 participants from 35 countries attended the meeting.

The meeting was opened by Robert N. Young, Chairman of the ICOS 92 Organizing Committee. Irina Beletskaya, Past-President of the IUPAC Organic Chemistry Division, then welcomed participants on behalf of the President of the Union.

Later in the day, with Organic Chemistry Division President Nelson Leonard in the Chair, Beletskaya and Georg Thieme Verlag publisher Albrecht Hauff presented Stuart L. Schreiber with the Thieme–IUPAC Prize in Synthetic Organic Chemistry (see *Chem. Intl.* **14**, 166 (1992)). The following report is largely based on the abstracts of a representative selection of the plenary and invited lectures.

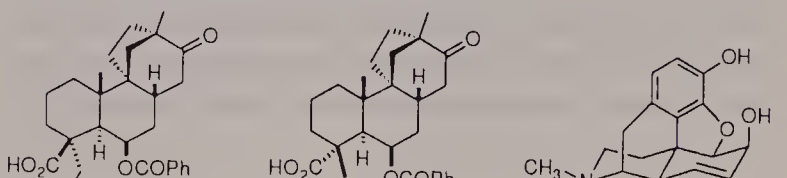
Montréal and UQAM, venue of ICOS 92.

Organometallic strategies

Larry Overman (University of California, USA) lectured on 'New organometallic strategies for preparing polycyclic molecules.'

He pointed out that insertion of unsaturated ligands into adjacent metal-carbon bonds (migratory insertion) is one of the fundamental reactions of organotransition metal chemistry. Nonetheless, it is only within the last five years that the power of tethered intramolecular insertions for assembling complex polycyclic ring systems has been fully realized.

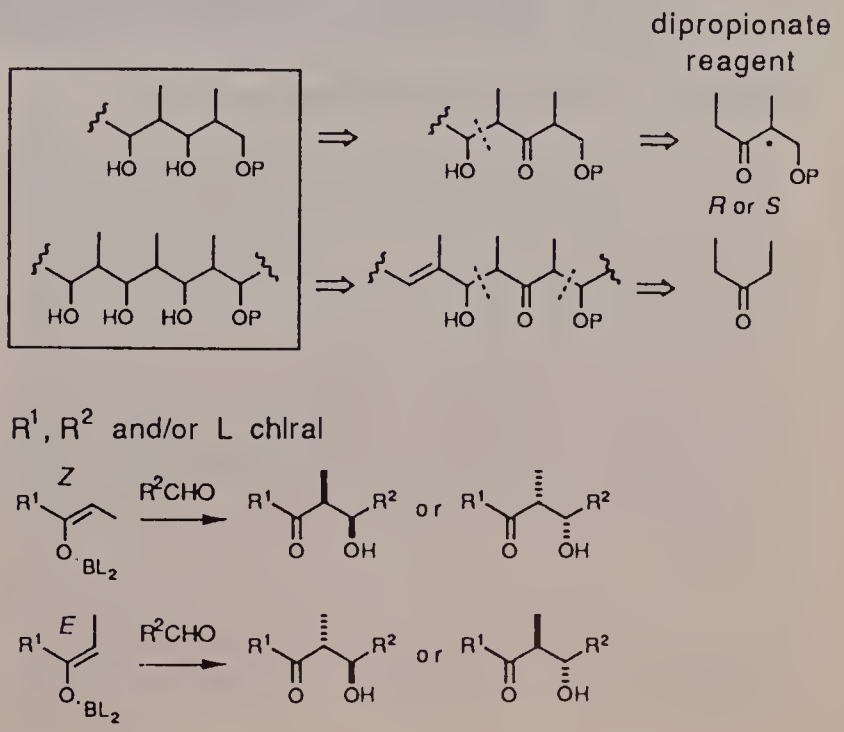
Overman described recent progress at the University of California in the area of palladium-catalysed polyene cyclizations. In particular, he emphasized stereocontrol and target-directed synthesis applications. The following are three of the synthesis targets of Overman's team:



Scopadulcic Acid A | Scopadulcic Acid B | Morphine

Following Overman's lecture, Ian Paterson (Cambridge University, UK) spoke about 'New methods and strategies for the stereocontrolled synthesis of polypropionate-derived natural products.

He said that ethyl ketone aldol reactions with aldehydes using chiral enol borinates make possible the stereocontrolled synthesis of elaborate segments of polypropionate-derived natural products (as shown in the box) — in a predictable and highly efficient manner.



Stereocontrol may originate from the chiral influence of the ketone (dependent on substitution pattern, R^1, and enol borinate geometry, *E* or *Z*), the aldehyde, and the boron reagent, or some combination of these (multiple asymmetric induction). Subsequent elaboration of the ß-hydroxyketone adducts can be performed with a high level of overall diastereoselectivity.

Paterson gave examples of these reactions in the context of the stereocontrolled synthesis of various polypropionate-derived natural products, including antibiotics (oleandomycin, rifamycin S), antitumour agents (swinholide A, scytophycin C) and enzyme inhibitors (ebelactone A).

Transannular Diels–Alder reaction

A lecture by Pierre Deslongchamps (Université de Sherbrooke, Quèbec, Canada) was entitled 'Transannular Diels–Alder reaction on macrocycles; a powerful synthetic strategy'.

Deslongchamps examined various aspects of the transannular Diels–Alder reaction with a view to developing a general method for the synthesis of a large variety of polycyclic compounds related to diterpenes, triterpenes and steroids.

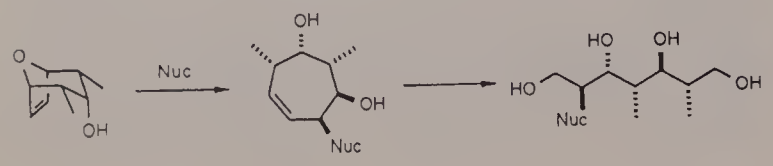
He laid emphasis on the control of the relative and absolute configuration of the polycyclic products and discussed the current knowledge and importance of the Diels–Alder transition state. He then examined the transannular Diels–Alder reaction of 14- and 15-membered macrocyclic trienes and presented some preliminary work on the synthesis of some specific target natural products.

Professors Irina Beletskaya and Nelson Leonard, respectively Past-President and President of the Organic Chemistry Division, at ICOS 92.

Control of multiple stereocentres

In a lecture during the morning of the second day of the scientific programme of ICOS 92, Mark Lautens (University of Toronto, Canada) outlined 'New methods for the control of multiple stereocentres.' He stated that reactions which assemble multiple stereocentres provide new avenues for the synthesis of complex natural products.

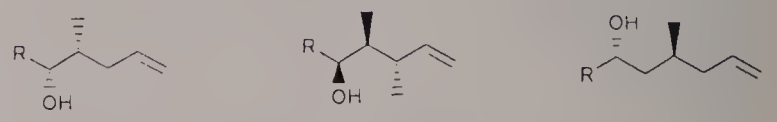
His lecture focused on recent progress in Toronto in the use of bicyclic molecules as conveyers of acyclic stereochemical information. He discussed nucleophilic ring opening and subsequent cleavage reactions of oxabicyclic compounds:



He also reported on the examination of a range of nucleophiles, including carbon, silicon and hydrogen with respect to their regio-, stereo-, and enantioselectivity of ring opening. Lautens illustrated the utility of this approach by reference to the syntheses of fragments of the natural products rifamycin, ionomycin, and bourgeanic acid.

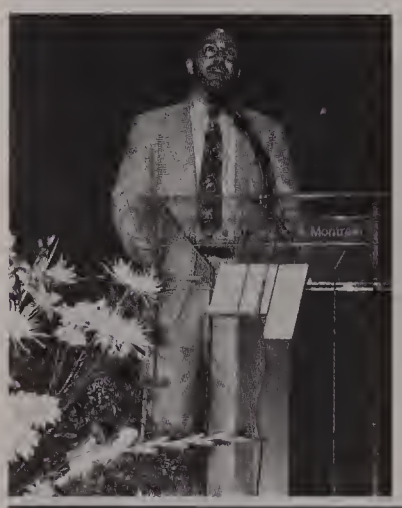
Jean F. Normant (Université Pierre et Marie Curie, Paris, France) presented a lecture on 'Organobismetallic zinc reagents: their preparation and use in diastereoselective reactions'.

Normant said that gem bismetallic reagents are easily obtained by addition of an allyl metal to a vinyl metal species, provided one of both metals is zinc. If a chiral centre is present in the vinylic part, and allows chelation, a diastereoselective addition occurs, leading to acyclic stereocontrol over one, two or even three other carbon atoms. For example, the following types of structures are easily prepared:



The first lecture on Wednesday morning was given by David A. Evans (Harvard University, MA, USA). The title was 'The issue of PI facial selectivity in enolate and carbonyl addition reactions.'

He presented a general discussion of diastereoselective bond constructions of chiral enolates along with an interpretation of the sense of asymmetric induction exhibited in the specific system. He also considered the reactions of these nucleophiles with chiral aldehydes and discussed general models for double stereodifferentiating aldo rections. Evans then outlined applications of this type of methodology to the synthesis of specific natural products.



Stuart Schreiber presents his Thieme–IUPAC award lecture.

Chiral titanium complex

Koichi Narasaka (The University of Tokyo, Japan) spoke about a 'Chiral titanium complex for the asymmetric construction of carbon frameworks.' Narasaka reported the generation of this complex by mixing $TiCl_2(OPr^i)_2$ and a chiral 1,4-diol derived from dimethyl tartrate. This complex catalyses asymmetric carbon–carbon bond forming reactions as a chiral Lewis acid.

By employing various 3-(2-alkenoyl)-1,3-oxazolidin-2-ones as dienophiles, asymmetric Diels–Alder reactions proceed in high enantioselectivity. Furthermore, the application of the catalyst to the intramolecular Diels–Alder reaction provides an efficient route for the preparation of perhydronaphthalene moieties of mevinic acids.

The titanium complex also catalyses the [2+2] cycloaddition reaction between 2-alkenoyl-1,3-oxazolidinones and vinyl sulfides, such as ketene dithioacetals, vinyl sulfides, acetylenic sulfides, and 1,2-propadienyl sulfides. The corresponding cyclobutanes, cyclobutenes, and methylene cyclcobutanes are obtained with high optical purity.

Osmium-catalysed asymmetric dihydroxylation

Barry Sharpless (The Scripps Research Institute, La Jolla, USA) presented a lecture on 'A new ligand class and a process improvement for the osmium-catalysed asymmetric dihydroxylation'.

He explained that the asymmetric dihydroxylation process has proven amenable to steady improvement over the past four years, but even the most optimistic forecasts could not have anticipated the events of the past several months.

The two new discoveries are the phthalazine class of ligands and the acceleration of osmate ester hydrolysis in the presence of organic sulfonamides. Taken together these advances have led to one general procedure which is applicable to a wide range of olefinic substrates.

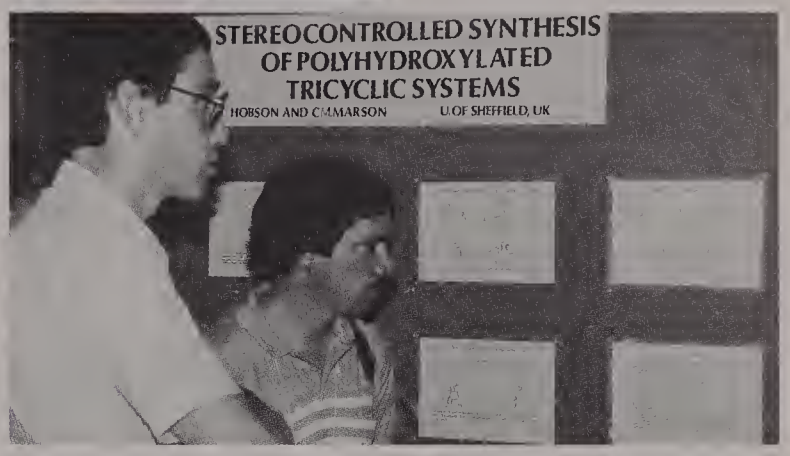
TADDOLS

Dieter Seebach (ETH Zentrum, Zürich, Switzerland) delivered a lecture on the 'Preparative and mechanistic aspects of catalytic enantioselective reactions involving α,α,α′,α′-tetraaryl-1,3-dioxolan-4,5-dimethanols (TADDOLs).

Seebach said that the diarylmethanol (DAM) group is increasingly employed in the preparation of enantiomerically pure compounds (EPCs). The DAM moiety is readily introduced by Grignard addition to ester groups, and is now used for both resolutions and enantioselective reactions with stoichiometric or catalytic applications.

His lecture focused on TADDOLs derived from tartrate acetals. These are used as ligands in organometallic reagents readily available in both enantiometric forms. Cyclic titanates bearing DAM-containing ligands are capable of catalyzing enantioselective tetraisopropyl-titanate-mediated nucleophilic additions of organozinc compounds. Seebach described the *in-situ* preparaton of these from Grignard reagents in ether.

He reported that unusually high stereoselectivities are obtained with saturated and unsaturated aliphatic aldehydes,



Poster session at ICOS 92.

including chiral ones, and ß-naphthyl-substituted dioxolane dimethanolate ligands on titanium. A linear correlation between the enantiomeric purity of these ligands and of the products was observed. The same type of reagents can also be used for enantioselective alanate reductions of unsymmetrical ketones.

Seebach said that the X-ray crystal structure of clathrates and of a spirotitanate containing tetraaryl dioxolane dimethanol as well as NMR spectra demonstrate the local C_2-symmetry created by these ligands. He also described some mechanistic studies.

Hydrolase enzymes

Stanley Roberts (Exeter University, UK) lectured on 'The use of hydrolase enzymes in organic synthesis'. He said that the use of hydrolase enzymes to produce optically active alcohols and esters are exemplified by the synthesis of 13-HODE, leukotriene-B_4, and the pheromone eldanolide.

Roberts illustrated the employment of lipases in organic solvents with the preparation of aristeromycin and the anti-HIV agent carbovir. He also discussed the hydrolysis of phosphate esters and the use of this strategy to provide samples of optically pure carbocyclic nucleosides.

Peter G. Schultz (University of California, USA) spoke about catalytic antibodies. In his lecture he said that immunochemistry has historically focused on the nature of antigenicity and antibody-antigen recognition.

However, in the last 5 years, the field of immunochemistry has taken a new direction. With the aid of mechanistic and synthetic chemistry, the vast network of molecules and cells of the immune system has been tapped to produce antibodies with a new function — catalytic antibodies.

Because antibodies can be generated that selectively bind almost any molecule of interest, this new technology offers the potential to tailor-make highly selective catalysts for applications in biology, chemistry, and medicine. In additon, catalytic antibodies provide fundamental insight into important aspects of biological catalysis, including the importance of transition-state stabilization, proximity effects, general acid and base catalysts, electrophilic and nucleophilic catalysis, and strain.

Recent Reports

In this section we publish summaries of the most recent IUPAC recommendations on nomenclature and symbols and technical reports. The full texts of these recommendations and reports are published in *PAC*.

Guidelines for the presentation of quantum mechanical computational data in organic chemistry (Technical Report)

Guidelines are offered concerning information that should be reported in the primary chemical literature relating to the techniques and results of quantum mechanical calculations. The goal of these guidelines is to outline the information required to allow an informed reader to reproduce the results and make an objective evaluation of the quality of the work.

This report was prepared for publication by T. A. Albright and E. A. Halevi, Working Party on Quantum Chemical and Computational Data, Commission on Physical Organic Chemistry, Organic Chemistry Division, and published in Pure Appl. Chem. ***64****, 1203–1209 (1992).*

A collection of experiments for teaching photochemistry (Technical Report)

This report presents a selection of experiments in photochemistry, appropriate for first-year undergraduate level studies. It also provides a bibliography of 270 references to photochemical experiments described in *J. Chem. Ed.* and similar journals over several decades.

The following is the complete list of contents of the report including titles of the experiments:

- Introduction
- A guide to experimental organic photochemistry
- Absorption and emission of light
- Radiative and non-radiative processes
- How photoexcited states are created and decay
- Chemiluminescence
- Photochemical image formation by a silver halide process
- Photochemical decomposition of aromatic diazonium salts
- Photochromism
- Decrease of pH due to photoproduction of an acid
- Photoreduction of benzophenone
- Photodimerization of anthracene
- Photopolymerization of acrylamide
- Photocatalytic hydrogen evolution on zinc sulphide dispersion
- Extraction of photosynthetic pigments from green plants
- Bibliography

This report was prepared for publication by K. Tokumaru and J. D. Coyle, Commission on Photochemistry, Organic Chemistry Division, and published in Pure Appl. Chem, ***64****, 1343-1382 (1992).*

IUPAC poster

Copies of an IUPAC poster (see page 214 of the November 1990 issue of *CI*) are available **free of charge** to affiliates and members of IUPAC's commissions and committees. The poster is printed in blue and black on a white background and is approximately 42 × 59 cm in size.

IUPAC welcomes any publicity you can give to its activities. If you would like to display one or more copies of the poster in your department or elsewhere please write to the Affiliate Affairs Secretary stating your name and address and how many copies of the poster you wish to receive.

PAC review

Pure and Applied Chemistry (*PAC*) is IUPAC's official journal. It publishes the main invited lectures of symposia sponsored by the Union; the recommendations of its Commissions on nomenclature, symbols and units, and technical reports on standardization, recommended procedures, collaborative studies and data compilations. Summaries of the most recent IUPAC recommendations on nomenclature and technical reports appearing in *PAC* are published in *CI* in the section *Recent Reports*. In this section we take a brief look at the symposia and lectures published in recent issues of *PAC*.

Photocatalytic oxidation of organic contaminants in water

Ralph Matthews (CSIRO, Division of Coal & Energy Technology, Lucas Heights Research Laboratories, Menai, NSW, Australia) contributed a paper on 'Photocatalytic oxidation of organic contaminants in water: an aid to environmental preservation' at the IUPAC-sponsored 14th International Symposium on Photochemistry. Matthews lecture and other plenary lectures presented at this symposium, which was held in Leuven, Belgium, on 19–25 July 1992, are published in the September 1992 issue of *PAC*.

Phenol and phenols are present in many industrial wastewaters. In particular those arising from coke ovens, petroleum cracking and refining, surface coating preparation and engineering workshop operatons. (*Photo: UNESCO/Sunil Janah.)*

In the introduction to the published paper, Matthews writes that few regions on earth have abundant supplies of pure water. These locations are generally remote from intensive human activities because of climatic or topographic deterrents. Other locations with plentiful high quality water supplies have long been intensively developed. This development has resulted in a progressive deterioration of water quality in many places to the extent that water supplies formerly of good quality are now potentially hazardous to human health.

It is essential, says Matthews, that further pollution be prevented and that controls be introduced or enforced to curtail avoidable pollution and minimize the risk of accidental pollution. The challenge is to seek the most economical, effective means of doing this. Therefore, stricter controls on the discharge and storage of polluted effluents is an integral part of environmental preservation strategy along with a thorough investigation of new water treatment processes and efforts to improve existing water treatment technologies.

The removal of organic pollution from water supplies has traditionally been effected by adsorption with activated carbon, explains Matthews. However, some pollutants are poorly or not adsorbed by activated carbon and where adsorption is efficient the transfer of the pollutant from the aqueous to the solid phase does not provide a permanent removal of the hazard. The carbon must then be either regenerated or incinerated by some means which converts the adsorbed pollutant to totally innocuous products. In view of the formation of toxic, stable products such as dioxins, in some high temperature processes this may not always be easily ensured. For this reason attention is being given to alternative destructive oxidation processes for water treatment, frequently referred to as advanced oxidation processes.

The object of destructive oxidation processes is to mineralize organic contaminants, that is, convert them to carbon dioxide, water and the oxidized inorganic anions of any heteroatoms present. These processes frequently include the addition of oxidizing agents such as hydrogen peroxide and ozone in the presence of a catalyst or UV light. Hydroxyl radicals are known to be involved in most of these processes. Examples include UV/H_2O_2, Fenton's Reagent, UV/O_3, H_2O_2/O_3, O_3/pH, high energy radiation and photocatalytic oxidation (PCO).

The application of PCO to water treatment is a comparatively recent development. It offers certain advantages over the preceding oxidation processes. Matthews lists some of these advantages in his paper:

- There is no consumption of expensive oxidizing chemicals; the oxidant is atmospheric oxygen and the catalyst is non-hazardous.
- The light required to activate the catalyst may be long-wavelength UV transmitted by glass.
- The photocatalytic reaction may be driven by the natural UV component of sunlight.
- The oxidation is powerful and indisriminate leading to the mineralization of the majority of organic pollutants; exceptions are compounds which are resistant to OH radical attack such as carbon tetrachloride and cyanuric acid.

Much work has been undertaken in recent years in studying the PCO of many classes of organic compounds, especially priority pollutants, with attention to the identification of intermediate degradation products. Matthews reports that excellent reviews have recently been published.

Titanium dioxide is the most commonly used photocatalyst because certain forms have reasonable photo-activity and it is non-toxic, insoluble and comparatively inexpensive. In his paper, Matthews discusses the results obtained exclusively with Degussa P25 titanium dioxide.

The majority of the results reported concern the PCO degradation of phenol. Phenol and phenols are present in many industrial wastewaters. In particular those arising from coke ovens, petroleum cracking and refining, surface coating preparation and engineering workshop operatons. Phenol has been the subject of a number of detailed PCO research

publications and has been used in other studies where the PCO rates of a number of solutes have been determined under identical conditions.

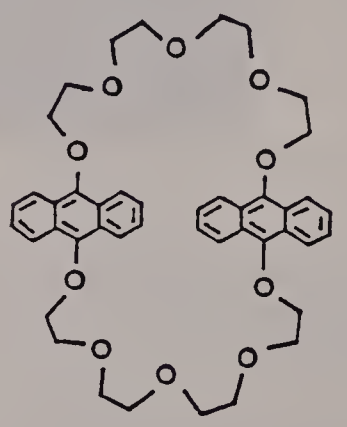
Matthews focuses attention on the degradation and mineralization rates that can be obtained using various illumination sources, both natural and artificial, with the photocatalyst immobilized or freely suspended in various photoreactor arrangements. He also considers the effects of possible interfering species and the mineralization rates obtained with real industrial wastewater matrices. Finally he outlines the use of a novel photocatalytic total organic carbon analyser in pollution control.

Affiliate contributions

IUPAC affiliates contributed papers to the Leuven symposium. For example, affiliate Frederick D. Lewis presented a plenary lecture on 'Styrene-amine and stilbene-amine intramolecular addition reactions.' The paper was co-authored by colleagues Dario M. Bassani and G. Dasharatha Reddy (Department of Chemistry, Northwestern University, Evanston, Illinois, USA).

The paper, published in the September issue of *PAC,* reports two mechanisms for the intermolecular photochemical addition reactions of styrenes and stilbenes with amines. Direct irradiation results in electron-transfer quenching of the singlet styrene by the amine, followed by hydrogen transfer and radical pair coupling. Electron-transfer-sensitized irradiation results in the formation of the styrene or stilbene cation radical which undergoes nucleophilic attack by amines. The intramolecular analogues of these reactions provide a versatile method for the synthesis of nitrogen heterocycles. The synthetic aspects of these reactions are discussed in the context of their reaction mechanisms.

IUPAC affiliate H. Bouas-Laurent (Photophysique et Photochimie Moléculaire, CNRS URA, Université de Bordeaux, France) was one of four co-authors from the university of a paper on 'Tunable photoresponsive supramolecular systems'. The paper reports the design of photoresponsive supramolecular systems including large crown-ether derivatives (see figure) based on the photochemical and photophysical properties of the anthracene ring and the investigation of these systems for their strong fluorescence dependence upon conformation effects, modulated by temperature, solvent polarity and complexation of charged species.



Cyclophane AA55, a large crown-ether derivative, in which A denotes one anthracene ring (anthracene-9,10-diyl) and 5 the number of oxygen atoms between the chromophores. Its photochemical properties are directed by the addition of sodium cations.

Provisional Recommendations

IUPAC seeks your comments

In this section we publish synopses of IUPAC's latest provisional recommendations on nomenclature and symbols. All comments on these recommendations are welcome and will be taken into consideration. The final revised versions are published in *Pure and Applied Chemistry* and synopses of these are published in *Chem. Intl.* as recent reports.

If you would like to comment on the provisional recommendations please write to your nearest national/regional centre requesting a copy of the full report. Copies are not available from the IUPAC Secretariat. The most up-to-date list of the national/regional centres appeared in *Chem. Intl.* **14**, 25 (1992).

Kinetics of composite reactions in closed and open flow systems

This paper is aimed at providing an accurate and non ambiguous description of reaction networks in closed or open systems involving possible density changes during the reaction. Owing to its systematic character, the proposed method is well suited to implementation on the computer for quantitative calculations, as those which are required for chemical engineering applications.

The treatment proposed below is based on standard methods used in Chemical Reaction Engineering (CRE). Unfortunately, the notations universally accepted in the CRE community, which created the corresponding concepts, are different from those recommended in the `Green Book' from IUPAC. This especially applied to the rate of reaction which is universally denoted r in the CRE literature instead of v, used by chemists. Related quantities such as the rate of production of species are denoted R_j (CRE) instead of r_j (IUPAC).

In order to avoid confusion among the chemist's community, the treatment follows the Green Book's recommendations. However, as this report may also be used by chemical reaction engineers, a summary of the main relationships is given with CRE notations in the Appendix.

Comments on the document are welcome and should be sent by 31 May 1993 to: Prof. Jacques Villermaux, Laboratoire des Sciences du Génie Chimique, CNRS, Ecole Nationale Supérieure des Industries Chimiques, Institut National Polytechnique de Lorraine, 1 Rue Grandville, B.P. 451, 54001 Nancy Cedex, France.

Definitions of terms relating to phase transitions of the solid state

This document provides definitions of phase transitions relating specifically to the solid state. It is intended for the professional scientist but not necessarily for the specialist chemist, physicist or materials scientist. An attempt has been made to produce a set of concise definitions. Certain definitions have been expanded where clarification was considered necessary. In certain instances, definitions have been quoted directly from the literature, while in others, definitions have been modified or abridged to suit the style of the document.

A single phase is present if all the parts of a material system are identical in chemical composition, measurable properties, and physical state. A phase transition represents a change in the nature of a phase or the number of phases as a result of some variation in externally imposed conditions, such as temperature, pressure, activity of a component or a magnetic or electric field.

The term "transition" (which can be replaced by the synonym "transformation") has been used broadly in the document to cover various types of phase changes. The types of transitions include:

- structural transitions of the solid state;
- transitions related to the change in the state of matter, i.e. from a solid phase to either a liquid or gaseous phase, or vice versa;
- transitions related to changes in composition;
- metallurgical transitions;
- transitions related to changes in the electronic structures of crystals;
- transitions that change thermodynamic properties or the disorder of a system;
- liquid-crystal transitions.

Polymeric transitions are considered to fall outside the scope of this document and have therefore not been included. Also omitted from the document are certain obscure definitions that have appeared in the literature that have not yet been commonly accepted, such as the metallurgical terms "military transition" and "civilian transition".

Comments on the document are welcome and should be sent by 31 May 1993 to: Dr M. M. Thackeray, Divisions of Materials Science and Technology, CSIR, PO Box 395, Pretoria 0001, Republic of South Africa.

Graphic representations of macromolecules (chemical formulae for polymers)

In chemistry, the unambiguous graphic representation of molecules is important for scientific communication. Such representation is especially important for macromolecules, which often exhibit a larger number of structural features than do molecules of low molecular weight. For example, the formula of a copolymer should immediately imply if it is meant to present a block copolymer or a copolymer with an unspecified sequence of monomeric units. Thus, a two-block copolymer consisting of a block containing p monomeric units A and a block comprising q monomeric units B is represented by the formula

$$-(-A-)_p-(-B-)_q-$$

whereas the corresponding random copolymer is represented by the formula

$$(—A—/—B—)_n$$

where $p + q = n$

Overall, the document provides rules and examples for the graphic representation of constitutional repeating units and monomeric units, regular and irregular polymers of simple as well as complex structures, including organic and inorganic homopolymers, alternating and periodic copolymers, statistical, random and unspecified copolymers, block copolymers and graft copolymers, including star polymers.

The proposed graphic representations of chemical formulae for polymers are suitable for representation through graphics computer programs.

Comments on the document are welcome and should be sent by 31 May 1993 to: Dr R. E. Bareiss, Die Makromolekulare Chemie, Hegelstrasse 45, D(W)-6500 Mainz, Federal Republic of Germany.

Basic classification and definitions of polymerization reactions

Polymerizations have traditionally been classified as addition polymerizations and condensation polymerizations. However, developments in chemical methods of polymerization and syntheses of new types of polymer have meant that more than two classes of polymerization need to be defined if a clear terminology is to be achieved. Several, alternative, two-fold terminologies have been introduced *ad hoc* into the literature. However, all have serious shortcomings in terms of comprehensiveness, unambiguity, and scientific correctness.

The present document defines basically four categories of polymerization — chain polymerization, condensative chain polymerization, polycondensation and polyaddition — which cover unambiguously all presently known types of polymerization. The definitions also allow further qualifications if desired, e.g. cationic chain polymerization.

The present definitions are in accord with the recommended *IUPAC Glossary of Terms for Physical Organic Chemistry* (1983) and the *IUPAC Basic Definitions of Terms Relating to Polymers* (1974).

Comments on the document are welcome and should be sent by 31 May 1993 to: Prof. I. Mita, Dow Corning Japan, Research Center, 603 Kishi, Yamakita-machi, Ashigarakami-Gun, Kanagawa, 258-01 Japan.

Structure-based nomenclature for irregular single-strand organic polymers

There is no accepted practice for the naming of many types of irregular polymers. This document describes a structure-based nomenclature system for irregular single-strand or-

ganic polymers, i.e. single-strand organic polymers whose molecules cannot be described by only one species of constitutional unit in a single sequential arrangement.

The new system names irregular polymers for which the source-based system is inadequate such as polymers that have undergone partial chemical modification, homopolymers having both head-to-tail and head-to-head arrangements of monomeric units, and polymers derived from a single monomer that can provide more than one kind of monomeric unit. In addition it provides a structure-based alternative to source-based nomenclature for copolymers.

Irregular polymers or blocks are named by placing the prefix "poly" before the structure-based names of the constitutional units collectively enclosed in parentheses with the individual constitutional units separated by oblique strokes. Block copolymers are named by using dashes for the bonding of blocks with each other and with junction units. For naming a graft or star polymer, the grafts or arms of stars are considered substituents to the main chain and named in a similar way to regular or irregular polymers.

Comments on the document are welcome and should be sent by 31 May 1993 to: Prof. I. Mita, Dow Corning Japan, Research Center, 603 Kishi, Yamakita-machi, Ashigarakami-Gun, Kanagawa, 258-01 Japan.

Recommended nomenclature for liquid–liquid distribution (solvent extraction)

The wide use of liquid–liquid distribution, ranging from an analytical chemical technique to a unit operation in various fields of chemical technology (e.g. petroleum refining, nuclear fuel processing, hydrometallurgy, food technology, biochemistry) has led to a proliferation of terminology. IUPAC Commission V.3 therefore saw the need to extend the scope of the definitions beyond those previously recommended (*Pure Appl. Chem.* **21**, 111–113 (1970)) and a list of terms, including those previously published, is presented under the following general headings: general definitions of phenomena, operations and relationships; components of the solvent phase; fundamental parameters for quantitative description of liquid-liquid distribution systems; process terminology applicable to large scale continuous operations.

Following the 35th IUPAC General Assembly in Lund in 1989 the responsibility for this project was transferred to the LLTC on Chromatography and Other Analytical Separations.

Comments on the document are welcome and should be sent by 31 May 1993 to: Dr Roger M. Smith, Department of Chemistry, Loughborough University of Technology, Loughborough, Leicestershire LE11 3TU, UK.

Recommendations for the nomenclature of chromatography. Supplement: Nomenclature for analytical pyrolysis

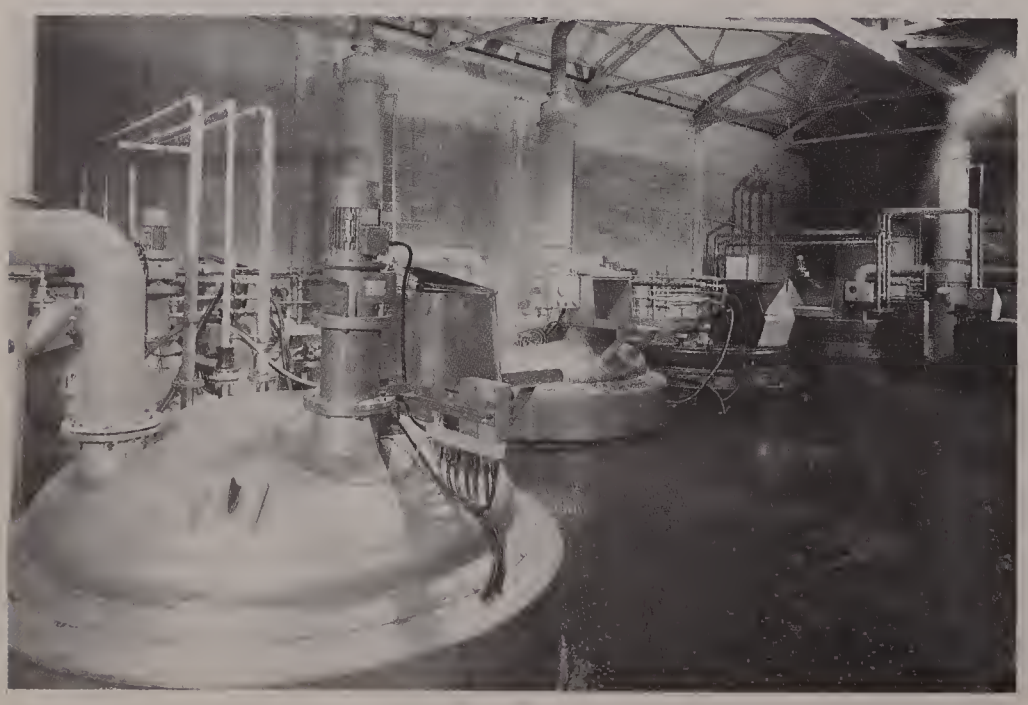
This proposed nomenclature describes terms and definitions for analytical methods using pyrolysis. It included definitions of the methods of pyrolysis that can be employed and terms to describe the equipment that is used, including coupled systems such as pyrolysis-mass spectrometry.

Comments on the document are welcome and should be sent by 31 May 1993 to: Prof. P. C. Uden, Department of Chemistry, Lederle Graduate Research Tower, University of Massachusetts, Amherst, MA 01003, USA.

Recommendations for the nomenclature of chromatography. Supplement: Nomenclature for supercritical fluid chromatography and extraction

This proposed nomenclature is intended to supplement the recently considered comprehensive *Nomenclature on Chromatography* and to systematically extend its coverage to separations and extractions employing supercritical fluids, which have come to prominence in recent years. It included definitions of the supercritical state and associated parameters and terms used specifically for the equipment, including coupled systems, and operation of separations in which the mobile phase is supercritical.

Comments on the document are welcome and should be sent by 31 May 1993 to: Dr Roger M. Smith, Department of Chemistry, Loughborough University of Technology, Leics. LE11 3TU, UK.



Liquid–liquid distribution is used widely in various fields of chemical technology. This has resulted in a proliferation of terminology. *(Photo BDH Chemicals Ltd.)*

Publications

Chemical safety matters

Chemical Safety Matters, a joint IUPAC–WHO publication, presents a concise review of the safe use and proper disposal of hazardous chemicals in laboratories. The history of this book dates back to 1975 — as explained in the Preface to the book:

In 1975, a planning group of the United States National Academy of Sciences concluded that there was need to recommend procedures for the safe use and disposal of harmful substances in chemical laboratories. The intention was to encompass all types of laboratories where chemicals are used, and to include not only hazards from acute or chronic chemical toxicity (including carcinogenicity), but also general hazards such as fires and explosions. However, special hazards from physical sources, such as radioactivity or lasers, or from biological sources, such as pathogenic bacteria or viruses, would not be considered in detail. The recommendations were to be limited to laboratory operations, where relatively small quantities of chemicals are used; they were not intended to apply to larger-scale operations such as pilot plant or manufacturing processes.

With this remit, a committee chaired by Herbert O. House was convened, comprising representatives of academic, governmental, and industrial laboratories. The first phase of the study was a survey of the safety practices which were being followed by representative laboratories. The combined experience and knowledge of individuals from those laboratories served as the basis for the procedures which were recommended in a study report published in 1981 by the National Academy Press under the title Prudent Practices for Handling Hazardous Chemicals in Laboratories.

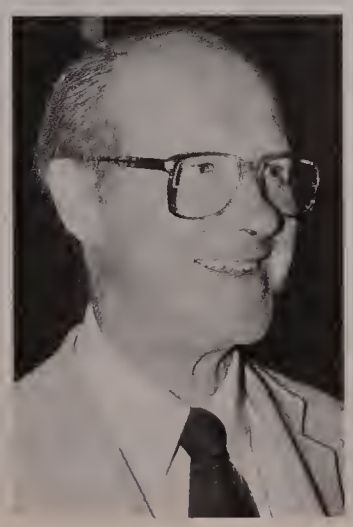
As that report was being completed, elaborate regulations on the management of hazardous wastes, prepared by the United States Environmental Protection Agency, became effective. Many laboratories — academic, governmental, and industrial — found difficulty in understanding and complying with these regulations.

Accordingly, a committee chaired by Robert A. Alberty, also under the aegis of the National Academy of Sciences, undertook a study of the disposal of chemicals from laboratories. The objective was to develop guidelines and procedures for such disposal that would be safe and environmentally acceptable. As with the first report, the procedures were framed for laboratory operations, in which many types of chemicals are used in relatively small quantities; they were not intended to be applicable to manufacturing operations, where, in general, a smaller variety of chemicals is used on a much larger scale. The recommendations of the committee were published by the National Academy Press in 1983 under the title *Prudent Practices for the Disposal of Chemicals from Laboratories*. Concern about the proper use of chemicals in laboratories and their disposal was — and is — worldwide.

Bill Schneider, President of IUPAC from 1983–85, suggested that key information about the proper use of chemicals in laboratories and their disposal could be made more readily available to many countries.

In 1984 the IUPAC President, William G. Schneider, suggested that the key information on these problems could be made more readily available to many countries by consolidating the two National Academy reports and omitting material that was specific to the United States of America. The abridgement involved deleting the extensive discussions of United States regulations, but indicating in general terms the kinds of practices and regulations that are common in other countries. In addition, parts of the two reports have been rearranged, updated, and some new procedures added so as to enhance the usefulness of the book both in teaching and in laboratory practice.

The International Programme on Chemical Safety (IPCS) — a joint venture of the International Labour Office (ILO), the United Nations Environment Programme (UNEP), and the World Health Organization (WHO) — was established in 1980 as the scientific response of the United Nations system to the challenges presented to the health of present and future generations, and to the quality of the environment, by the widespread utilisation of chemicals throughout the world. The objectives of the IPCS are two-fold: firstly, to catalyse and coordinate activities in relationship to chemical safety, particularly as far as the assessment of the risks to human health and to the environment from exposure to chemicals is concerned; secondly, to strengthen capabilities so as to ensure the protection of human health and of the environment from the deleterious effects of chemicals in all aspects of their production, transportation, handling, use, and disposal.



IUPAC Bureau member and Physical Chemistry Division President Bob Alberty undertook a study of the disposal of chemicals from laboratories.

In fulfilling its objectives, the IPCS enlists the support of the technical community, part of which is represented through IUPAC which has official non-government organization status with the WHO. Policy guidance for the work of IPCS is provided through a Programme Advisory Committee; at its fifth meeting, in October 1986, when it was reviewing work initiated earlier on quality assurance in laboratory studies, this committee emphasised the need to provide guidance on protection of laboratory workers health and their safety, and on safe disposal of their laboratory toxic wastes. Attention was drawn to the need to provide a practical manual for use of laboratories in developing countries.

During consultations between the President of the Clinical Chemistry Division of IUPAC and the Manager of the IPCS, it became evident that the efforts of IUPAC to consolidate the experience from North America on the laboratory handling and disposal of hazardous chemicals could form the basis of such a practical manual and provide guidance to all countries. Moreover, through ICPS, it would be possible to obtain inputs from parts of the world where IUPAC is not represented. In the context of an IPCS meeting on Recommended Operating Procedures for Laboratories, held in Finland, October 1987, the draft IUPAC document on prudent practices for handling and disposal of hazardous laboratory chemicals was examined with a view to how it could be adapted to meet the needs of IPCS for a practical manual and for global guidance. Comments from this meeting were incorporated into the draft document. The IPCS mechanisms for peer review were then utilised in order to obtain a broad consensus and to ensure that the document took fully into consideration experience and conditions in all regions of the world.

IUPAC and the IPCS designated Howard G.J. Worth and Peter Bach respectively to assist in editing the document. A joint IPCS/IUPAC Editorial Group met in the United Kingdom, in December 1988, in order to review comments and input from referees and to prepare the text for publication. While this publication is based in part on the two National Academy of Sciences' publications, quoted above, it does not contain the United States of America's regulations and background, to which the reader is referred and which are available from the National Academy Press, Washington DC.

Chemical Safety Matters summarizes the direct and indirect hazards which are found in chemical laboratories, and is intended to encourage a thoughtful and alert approach to the storage, use and disposal of chemicals. It provides valuable guidance to the many problems that may be seen as a result of the inappropriate handling of chemicals, where ignorance and lack of planning impair safety and may also result in contamination of the environment.

There is a vast number of chemicals that have found essential applications in laboratories for teaching, research, manufacturing production, and quality control. Each of these chemicals offers the potential for safe and sensible use, provided that there is good understanding of the many factors that affect its handling and disposal. Much of the basis for the safe use and disposal of chemicals depends on proper long term planning that allows a full safety concept to be built into the organization, together with an active awareness and training for all concerned.

This book is designed as a laboratory reference that will fulfil the needs of a broad range of technicians, scientists and teachers working in fields such as chemistry, biology, pathology, clinical biochemistry, chemical engineering and agriculture. It will also be useful for laboratory managers, research students, and environmental officers, who need to have clear guidelines of what procedures should be undertaken to ensure the safe use of all chemicals and the least possible risk to the general population.

Chemical Safety Matters *is published on behalf of IUPAC and WHO by Cambridge University Press, Cambridge, UK, 1992. xviii + 284 pp. ISBN 0 521 41375 3. Price: GBP 19.95 + GBP 2.50 postage and packing + GBP 2.50 airmail. Copies are available from Customer Services Department, Cambridge University Press, The Edinburgh Building, Cambridge CB2 2RU, UK. Tel: +44 (223) 325970. Fax: +44 (223) 325959.*

Chemistry students at the University of St Andrews, Scotland, using laboratory fume cupboards. Chapter 3 of *Chemical Safety Matters* considers laboratory ventilation in general and the use of laboratory hoods in particular.

Low-cost equipment

Locally Produced Low Cost Equipment for Teaching of Chemistry, prepared by K. V. Sané (University of Delhi) and D. C. West (University of Mauritius) is a 250 page monograph based on work done under a 10-year project sponsored by IUPAC, UNESCO and the International Council of Scientific Unions (ICSU).

The project, directed by Sané (who is also the current Chairman of the IUPAC Committee on Teaching of Chemistry) is concerned with one of the major problems in the teaching of chemistry in less developed countries, namely the non-availability of simple and reliable equipment which is easy to assemble and easy to maintain.

The monograph describes the fabrication, use and maintenance of three instruments (a pH meter, a conductometer and a colorimeter) having widespread utility for student level laboratory work in chemistry. Also described are the fabrication of two test instruments (a continuity tester and an OVA source which are useful either for trouble shooting or for calibration) and of several accessories like a magnetic stirrer, a zero-cost electrode for pH measurement, and a conductance cell.

Brief theoretical sections in electronics and in chemistry are included to make the presentation self-contained. No previous experience in instrument fabrication is assumed; practical techniques like soldering, PCB making and circuit board assembly, are consequently described in detail. The monograph is liberally illustrated and uses a highly visual style in which constant reference is made to the figures.

Limited stocks of the monograph are available at GBP 13.00 including postage from Peter Towse, Editor INCE, C.S.S.M.E., University of Leeds, Leeds LS2 9JT, UK. Cheques should be made payable to 'International Newsletter on Chemical Education'.

Macromolecule–metal complexes

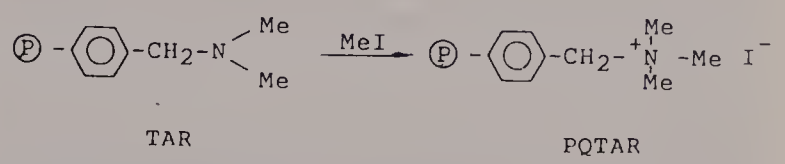
The 4th International Symposium on Macromolecule–Metal Complexes took place in Siena, Italy, 30 September–5 October 1991. The meeting was sponsored by the IUPAC Macromolecular Division. A total of 32 invited lectures and selected papers presented at the symposium were published in the June 1992 issue of *Die Makromolekulare Chemie: Macromolecular Symposia.* The symposium editors were Francesco Ciardelli (University of Pisa) and Rolando Barbucci (University of Siena).

The scientific programme of the symposium was devoted to the following topics:

- Transition metal derivatives for the preparation of macromolecular systems.
- Electroconducting polymer–metal composites.
- Polymer-supported metal complex catalysts.
- Interactions in macromolecule–metal complexes.

These topics were selected to highlight the emergence of new synthetic organometallic chemistry for the preparation of macromolecules and the unusual properties of novel materials based on macromolecule-metal complexes. Topics covered by the symposium presentations ranged from structural and mechanistic studies to the development of new processes and materials.

A number of IUPAC affiliates were authors or co-authors of papers presented at the symposium. For example Juntan Sun and Binglin He were amongst four authors from the Institute of Polymer Chemistry, Nankai University, Tianjin, Peoples Republic of China, who contributed a paper on 'Effects of chemical modification of supports on properties of tertiary amino resin dispersed palladium catalysts for the hydrogenation of methyl acrylate.'



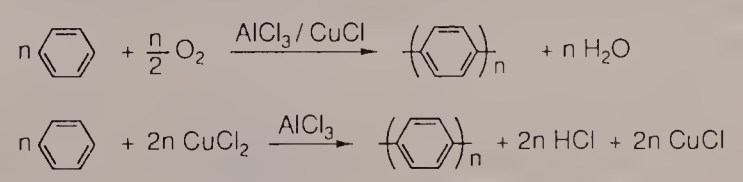
Quaternization of TAR with methyl iodide

The team chemically modified tertiary amino resins (TAR) by quaternization with methyl iodide. By this route, they synthesized six partly quaternized tertiary amino resins (PQTAR) with different I/N mole ratios. The Nankai researchers tested four different reducing agents (NaH, $LiAlH_4$, CH_3OH–NaOH and $NaBH_4$) for the preparation of palladium catalysts dispersed on TAR and PQTAR. They found the rate of hydrogenation of methyl acrylate and the amount of Pd leached from the catalysts during the hydrogenation reaction to be dependent not only on the type of reducing agent but also on the structure of polymer support. Both the rate of hydrogenation and the amount of Pd eluted closely related to the I/N mole ratio of the polymer supports.

Synthesis of electroconducting polymers

Affiliate Naoki Toshima (University of Tokyo, Japan) presented a paper on 'Novel synthesis of electroconducting polymers from simple monomers with transition metal complex catalysts.'

Toshima reported the successful preparation of electroconductive polyaromatics or polyarylenes by the oxidative polymerization of the corresponding simple monomers over a transition metal complex catalyst. For example, poly(1,4-phenylene) was prepared from benzene by using oxygen as an oxidant and a copper(I) chloride-aluminium chloride double complex as the catalyst.



Preparation of poly(1,4-phenylene) from benzene

The same catalytic system was applied to the preparation of poly(2.5-pyrrolylene) and poly(2,5-thienylene) from pyrrole and 2,2′-bithiophene, repsectively. Toshima also carried out the electrochemical oxidative polymerization for the preparation of the poly(1,4-phenylene) and poly(1,4-napthylene) films in the presence of copper(I) chloride and aluminium chloride.

Voltammetric study

IUPAC affiliate M. Esteban and colleagues from the Department of Analytical Chemistry at the University of Barcelona, Spain, contributed a paper on 'Voltammetric study of some macromolecular-metal complexes.' They used voltammetry to investigate complexes formed by metal ions such as Zn^{2+}, Cd^{2+}, Pb^{2+}, and Cu^{2+} and macromolecules such as polymethacrylic acid (PMA), polyacrylic acid (PAA), alginic acid (AA) and polygalacturonic acid (PGA).

The Spanish group used several voltammetric techniques: sampled direct current polarography (DCP), normal pulse polarography (NPP), differential pulse polarography (DPP), reverse pulse polarograhy (RPP), cyclic valtammetry (CV) and differential pulse anodic stripping voltammetry (DPASV).

Their results confirmed the validity of the model for the determination of not only formation constants but also diffusion coefficients of the complexes. The behaviour of some systems agreed with that predicted by the model. Other systems only partially fulfilled the predictions for reasons discussed in the paper.

Functionalization of silica

Affiliate Yasuhiko Kurusu (Sophia University, Tokyo, Japan) spoke about the 'Functionalization of silica(II) — Oxidation of cyclohexanes in the presence of functionalized silica complexed by iron and copper.'

Kurusu prepared the functionalized silica (FS) catalyst by modifying silica gel with (N,N-dimethyl-3-aminopropyl) trimethoxysilane. The catalyst complexed with iron and copper to form FS-1(Fe) asnd FS-1(Cu), respectively. Kurusu reported that 11.2% of methylcyclohexane was oxidized in the presence of oxygen with FS-1(Fe) at 60°C. He obtained 2-hydroxymethylcyclohexane in 59% yield. Kurusu discussed the structural differences between FS-1(Fe) and FS-1(Cu).

Contribution from Yemen Republic

Ali El-Shekeil (Chemistry Department, Sana'a University, Yemen Republic) is IUPAC National Affiliate Membership Secretary in the Yemen Republic — there are currently 30 IUPAC affiliates in the country. El-Shekeil co-authored a paper with Adel Z. El-Sonbati (from the same department at Sana'a University) which was presented at the Siena symposium. The paper was entitled 'Complexing ability of poly(5-vinylsalicylidene-2-aminopyridine) towards different metal(II) salts.

El-Shekeil and El-Sonbati prepared mononuclear and binuclear complexes of poly(5-vinylsalicylidene-2-aminopyridine) using copper(II), cobalt(II), nickel(II), cadmium(II), dioxuranium(II) and palladium(II) salts. They reported that the metal(II) acetates and palladium chloride gave mononuclear complexes whilst copper(II) chloride gave a binuclear complex. The polymer complexes were characterized on the basis of elemental analysis, UV, IR and magnetic susceptibility.

The stereochemistry and nature of the complexes are markedly dependent upon the mole ratio of the reactants and the anions. In all complexes the homopolymer was chelated to the metal ion via the nitrogen atom of the azomethine group

Ali El-Shekeil, co-author of a paper presented at the Siena Symposium, is the IUPAC National Affiliate Membership Secretary in the Yemen Republic.

and oxygen atom of the phenolic group. A low value of the magnetic moment of binuclear copper complexes was due to the antiferromagnetic interaction between two adjacent copper atoms. El-Shekeil and El-Sonbati calculated the ligand field parameters and related them to the electronic environments.

Other affiliate contributions

IUPAC affiliate François Diederich was one of seven authors who contributed a paper on 'Structure and properties of superconducting and non-superconducting alkali-metal fullerides A_xC_{60} (A= Na, K, Rb, or Cs)'. The team are from the Departments of Chemistry and Biochemistry and of Physics and the Solid State Science Center, University of California, Los Angeles, USA.

Affiliate Jan Reedijk (Leiden University, The Netherlands) and G. Challa, and W. Chen (both at the University of Groningen, The Netherlands) co-authored a paper on 'Oxidative phenol coupling catalysed by polymer-bound copper-imidazole complexes.'

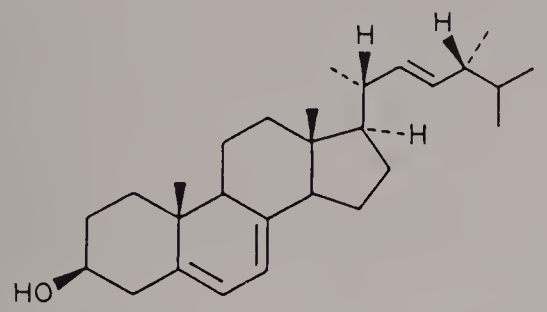
Invited lectures and selected papers presented at the 4th International Symposium on Macromolecule–Metal Complexes held in Siena, Italy, 30 September-5 October 1991, edited by Francesco Ciardelli and Rolando Barbucci, were published as Volume 59 (June 1992) of Die Makromolekulare Chemie, Macromolecular Symposia *by Hüthig & Wepf, Basel, Switzerland, 1992. xi + 403pp. ISBN 3-85739-257-6. Price SFR 128.00/DEM 148.00/ USD 83.00 + postage and handling.*

Biochemical nomenclature

The *Compendium of Biochemical Nomenclature and Related Documents* is the fourth publication of the International Union of Biochemistry (IUB) [recently renamed International Union of Biochemistry and Molecular Biology (IUBMB)] of a compendium of 'Recommendations on Biochemical Nomenclature'. The first two editions of the compendium were prepared and distributed in 1973 and 1975, respectively, by the American Society of Biological Chemists. This edition, like the third one published in 1978, has been prepared by the IUB Committee of Editors of Biochemical Journals (CEBJ) with the full support of the IUPAC and is published and distributed by the Publishing House of the Biochemical Society.

An example

The following structure and recommended name of the steroid with the trivial name ergosterol is just one example of several hundred structures and names published in the *Compendium of Biochemical Nomenclature and Related Documents*. It is taken from the IUPAC–IUB Joint Commission on Biochemical Nomenclature (JCBN) document 'The nomenclature of steroids: Recommendations 1989' which was originally published in *Eur. J. Biochem.* **186**, 429–458, (1989).



(22*E*)-(24*R*)-24-Methylcholesta-5,7,22-trien-3β-ol
or (22*E*)-ergosta-5,7,22-trien-3β-ol
trivial name ergosterol

This volume includes the current recommendations on biochemical nomenclature issued originally by the IUPAC–IUB Commission on Biochemical Nomenclature (CBN), in some cases jointly with the IUPAC commission on the Nomenclature of Organic Chemistry (CNOC) and subsequently by the IUPAC–IUB Joint Commission on Biochemical Nomenclature (JCBN) and the Nomenclature Committee of IUB (NC-IUB). These recommendations have all been published previously in one or more of the biochemical journals represented in CEBJ. In general, the publication in the *European Journal of Biochemistry* has been reproduced in this volume. In some cases, duly acknowledged at the end of the documents, the original printing in another journal was photographically reproduced in the *European Journal of Biochemistry*, in accordance with an agreement among member journals of CEBJ.

In addition to the recommendations on biochemical nomenclature, this volume also includes rules or recommendations issued by other nomenclature commissions that are of interest to biochemists. These are sections E (stereochemistry) and F (natural products) issued by the IUPAC Commission on the Nomenclature of Organic Chemistry, and the 'Recommendations for the Presentation of Thermodynamic and Related Data in Biology' issued by the IUPAC-IUPAB-IUB Joint Commission on Biothermodynamics. It also includes other documents of CEBJ 'Recommendations for the Citation of Bibliographic References', and excerpts from newsletters of the nomenclature committees of IUB that are regularly published in the CEBJ journals. A list of other documents of interest to biochemical authors and editors is given at the end of the volume.

The compendium covers the nomenclature of: stereochemistry; natural products and related compounds; isotopically modified compounds; amino acids and peptides; synthetic polypeptides; peptide hormones; glycoproteins; glycopeptides and peptidoglycans; nucleic acids and polynucleotides.

It also deals with conformation of polynucleotide chains; incompletely specified bases in nucleic acid sequences; carbohydrates; cyclitols; numbering of atoms in *myo*-inositol; five- and six-membered forms of monosaccharides; abbreviated terminology of oligosaccharide chains; conformation of polysaccharides; lipids, steroids, quinones with isoprenoid side chains; carotenoids; tocopherols; vitamin D; retinoids; prenols; phosphorus-containing compounds; folic acids; vitamin B6; corrinoids; and tetrapyrroles.

There are sections on initiation, elongation and termination factors in eukaryotes; multiple forms of enzymes; enzyme kinetics; multienzymes; conformation of polypeptide chains; thermodynamic and related data; and bibliographic references.

Compendium of Biochemical Nomenclature and Related Documents *is edited by Claude Liébecq and published by Portland Press, London, UK, 1992. x + 347 pp. ISBN* 1 85578 005 4. *Price: GBP 18.00/USD 36.00. Orders should be sent to: Portland Press Ltd, Commerce Way, Whitehall Industrial Estate, Colchester, CO2 8HP, UK. Tel: +44 (206) 796351. Fax: +44 (206) 799331.*

Cationic polymerizations

The IUPAC-sponsored 10th International Symposium on Cationic Polymerizations and Related Processes was held on 26–29 August 1991 in Balatonfüred, Hungary. The symposium was organized under the auspices of the Kossuth Lajos University of Debrecen and the Debrecen Group of the Hungarian Academy of Sciences attended by about 110 scientists from 22 countries.

The scientific programme included invited lectures, oral and poster communications from various fields of cationic and anionic polymerizations. The invited lectures, edited by Tibor Kelen and Miklos Zsuga, were published in Volume 60 of *Makromol. Chem. Macromol. Symp.* (July 1992).

Some of the topics discussed at the symposium were related to important new developments in polymerization mechanisms, in cationic olefin and ring-opening polymerizations, in cationic and anionic synthetic techniques of telechelics, functional polymers, networks, block and graph copolymers for example.

Balatonfüred: venue of the 10th International Symposium on Cationic Polymerizations and Related Ionic Processes.

ISO Standards

The following are some of the new international standards announced by the International Organization for Standardization (ISO) in recent issues of *ISO Bulletin*:

July 1992 issue of *ISO Bulletin:*

TC 17	**Steel**
ISO 10714:1992	Steel and iron — Determination of phosphorus content — Phosphovanadomolybdate spectrophotometric method
TC 33	**Refractories**
ISO 10058:1992	Magnesites and dolomites — Chemical analysis
TC 34	**Agricultural food products**
ISO 6558-2:1992	Fruits, vegetables and derived products — Determination of carotene content — Part 2: Routine methods
TC 35	**Paints and varnishes**
ISO 8502-2:1992	Preparation of steel substrates before application of paints and related products — Tests for the assessment of surface cleanliness — Part 2: Laboratory determination of chloride on cleaned surfaces.
TC 44	**Welding and allied processes**
ISO 9455-3:1992	Soft soldering fluxes — Test methods — Part 3: Determination of acid value, potentiometric and visual titration methods
TC 45	**Rubber and rubber products**
ISO 506:1992	Rubber latex, natural, concentrate — Determination of volatile fatty acid number
ISO 2005:1992	Rubber latex, natural, concentrate — Determination of sludge content
ISO/TR 11753:1992	Rubber and rubber products — Confidence intervals of repeatability and reproducibility values determined by inter-laboratory tests
TC 129	**Aluminium ores**
ISO 8685:1992	Aluminium ores — Sampling procedures
TC 146	**Air quality**
ISO 9096:1992	Stationary source emissions — Determination of concentration and mass flow rate of particulate material in gas-carrying ducts — Manual gravimetric method

August 1992 issue of *ISO Bulletin:*

TC 34	**Agricultural food products**
ISO 5507:1992	Oilseeds — Nomenclature
ISO 5511:1992	Oilseeds — Determination of oil content — Method using continuous-wave low-resolution nuclear magnetic resonance spectrometry (Rapid method)
ISO 9167-1:1992	Rapeseed — Determination of glucosinolates content — Part 1: Method using high-performance liquid chromatography
TC 134	**Fertilizers and soil conditioners**
ISO 3944:1992	Fertilizers — Determination of bulk density (loose)
ISO 5311:1992	Fertilizers — Determination of bulk density (tapped)
ISO 7837:1992	Fertilizers — Determination of bulk density (loose) of fine-grained fertilizers
TC 138	**Plastics pipes, fittings and valves for the transport of fluids**
ISO 7686:1992	Plastics pipes and fittings — Opacity — Test method
ISO 8779:1992	Polyethylene (PE) pipes for irrigation laterals — Specifications

Official methods of analysis of the AOAC

For over 100 years, the Association for Official Analytical Chemists (now AOAC International) has been providing the analytical science community with fully validated standard methods for the chemical and biological analysis of foods, drugs, cosmetics, pesticides, fertliziers, feeds, hazardous substances, air, water, soil, and any other products and substances affecting the public health and safety, the economic protection of the consumer, or the quality of the environment.

The development, interlaboratory testing, and validation of AOAC Official Methods is carried by out a network of 1000 members/volunteers as part of their duties as staff scientists in government, university, and industry laboratories. AOAC boards, committees, and topic coordinators coordinate and oversee the process, receive and evaluate the results, and recommend or deny recommendation of methods for adoption. Finally, a favorable vote by the AOAC membership gives official sanction to methods meeting the Association's requirements.

AOAC International publishes adopted methods in *Official Methods of Analysis* which is revised and published every five years. Between editions, annual supplements are published containing the methods adopted by the Association during the previous year.

The recently published 15th edition contains over 1800 collaboratively tested and approved methods for chemical and microbiological analysis. These include 143 new methods, 81 revised or updated methods. The 15th edition consists of two volumes for more convenient use.

Official Methods of Analysis of the AOAC, Volumes I & II *was published by AOAC International, Arlington, USA, 1990. 1200 pp. ISBN 0-935584-42-0. Price: USD 268.00 in North America (USA, Canada, Mexico), USD 298.00 oustide North America. To order contact: AOAC International-DW, 1970 Chain Bridge Road, Dept. 0742, McLean, VA 22109-0742, USA. Tel +1 (703) 522 3032. Fax +1 (703) 522 5468.*

Effects of increased UV radiation on biological systems

The report *Effects of Increased Ultraviolet Radiation on Biological Systems* contains the proceedings of a workshop held in Budapest, on 17–22 February 1992. The workshop was arranged by the Scientific Committee on Problems of the Environment (SCOPE) in collaboration with the International Union of Pure and Applied Biophysics (IUPAB) and with the financial support of the Commission of the European Communities and the United Nations Environment Programme (UNEP).

The report is divided into two parts. Part one delineates the current state of the knowledge of the *effects* of UV radiation on biological systems. Part two provides a detailed research implementation plan of the specific experimental objectives and tasks needed to begin assessment of UV impact on biological systems.

The aim of the working group was to synthesize existing knowledge on the effects of UV radiation on biological systems, and to provide a plan of research to assess the

question of increased UV-B radiation ont he biosphere.

Some recent assessments of the stratosphere indicate high concentrations of chlorine over Northern and mid-latitudes in the Northern Hemisphere comparable to, if indeed not higher than, chlorine levels in the stratosphere over the Antartic. It appears, therefore, that there is a significant risk that ozone depletion will occur over heavily populated areas in the foreseeable future. Therefore, according SCOPE President John Steward and Edward De Fabo (Chairman of the Scientific Advisory Committee on UV-B Radiation), the need for assessing the accompanying increases in UV-B radiation and their impact of biological systems, including human systems, has now passed the theoretical stage. In fact, considering the long-term residence lifetime of chlorine in the atmosphere (estimates range from 50 to 100 years), a long-term commitment to research in UV-B radiation effects on the biosphere clearly needs to be started now as ozone depletion is expected to increase well into the next century.

The purpose of this report is to make available to international government agencies and to other interested parties a research implementation plan designed to investigate the changes to the biosphere caused by increased levels of solar UV-B radiation.

Address of SCOPE: 51 bd de Montmorency, 75016 Paris, France. Tel: +33 (1) 45250498. Fax: +33 (1) 42881466.

There is a clear need to start a long-term commitment to research on UV-B effects on the biosphere.

Letter to the Editor

Pyramidal Periodic Table

Sir,

Professor Gorin[1] disfavours the pyramidal form of Periodic Table[2,3] which I have suggested be adopted as standard[4] because the lanthanide and actinide elements are listed in the body of the table instead of being placed in a separate section. He prefers the latter arrangement because these elements "are more similar to one another than to any of the elements preceding them". I should like to make two comments about this.

The first is that the lanthanides and actinides do not have to be included in the body of a pyramidal table. They can be placed in a separate section if desired.[2]

Secondly, while it is true that the lanthanides constitute a family of closely similar elements, this is not the case for the actinides. For example, the oxidation number exhibited by the latter in aqueous solution vary from member to member almost as much as they do for transition elements (Table). Thus, while it may be justifiable to place the lanthanides in a separate group on the basis of their similar properties, it is not justifiable to do this for the actinides.

Inclusion of these elements in the body of the table has the advantage of bringing out such periodic relations as there are among them. For example, the tripositive ions of the actinides have the same outer electronic configurations (f^n) as the corresponding lanthanide ions.[5] In a pyramidal table their inclusion also brings out periodic relations with other elements, e.g. between cerium, thorium, and members of the titanium group.[2]

It is true that some lanthanide-actinide pairs have relatively little in common (e.g. neodymium and uranium). However, this is merely hidden when the two series are grouped together in a separate section. when they are included in the table these pairs can be indicated by means of broken lines.[3]

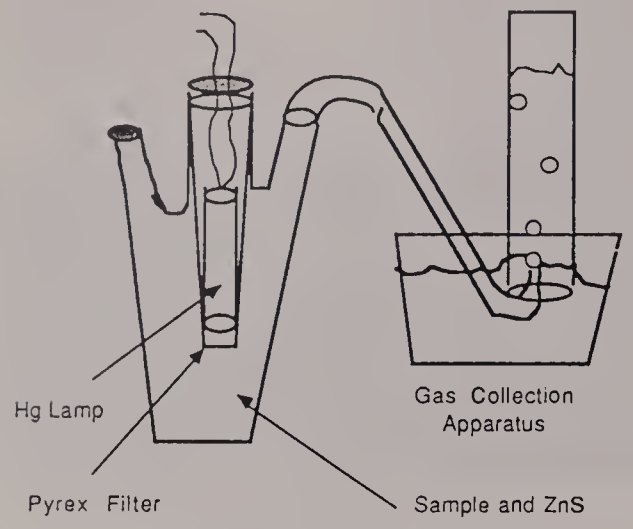
P.G. Nelson
University of Hull
UK

References

1. G. Gorin, *Chem Intl.* **14**, 128–129 (1992).
2. P.G. Nelson, *Educ. Chem.* **24**, 171–173 (1987). (Corrections: *Educ. Chem.* **25**, 3 (1988).)
3. P.G. Nelson, *Chem Intl.* **11**, 171–173 (1989).
4. P.G. Nelson, *Chem Intl.* **13**, 199 (1991).
5. J.J. Katz, G.T. Seaborg and L.R. Morss (Eds), *The Chemistry of the Actinide Elements*, 2nd Edn, Vols 1–2. Chapman and Hall, London, 1986.

Table. Oxidation states of the actinides in aqueous solution (most stable state in bold print)[5]

Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr
											2	2	**2**	
3			3	3	3	**3**	**3**	**3**	**3**	**3**	**3**	**3**	3	**3**
	4	4	4	4	**4**	4	4	4						
		5	5	**5**	5	5								
			6	6	6	6								
				7	7									



Photochemistry

The above figure is a schematic representation of a photochemical reactor for irradiation of ZnS suspensions and collection of gases produced. It is taken from an experiment on 'Photocatalytic hydrogen evolution on zinc sulfide dispersion' by Shozo Yanagida (Osaka University, Japan) which was one of a collection of experiments for teaching photochemistry published as a technical report in the September issue of *PAC* (see page 14).

This collection of experiments was prepared for publication by K. Tokumaru and J. D. Coyle of IUPAC's Commission on Photochemistry. This issue of *CI* also reviews some of the plenary lectures presented at the IUPAC-sponsored 14th International Symposium on Photochemistry held in Leuven, Belgium, in July 1992 and published in the same issue of *PAC* (see page 14). Coyle's report of the meeting of the Commission on Photochemistry which was held at the same time as the symposium is also included in this issue of the magazine (see page 31) — which all goes to show that the Union is photochemically active!

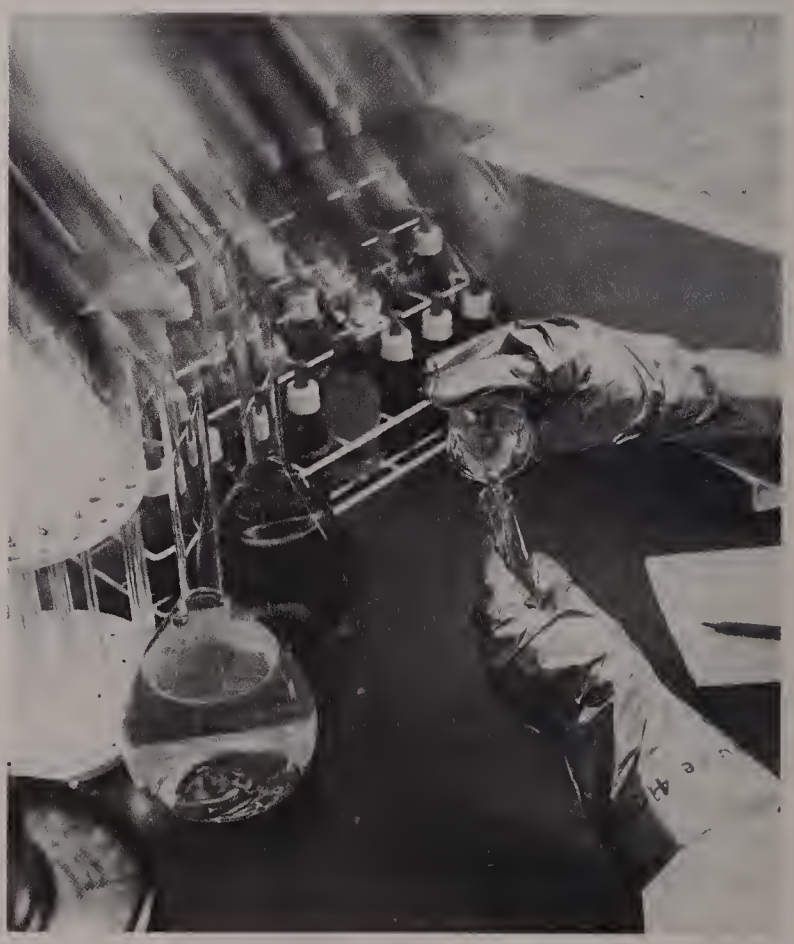
Protective clothing

It is impossible to foresee every conceivable situation that may arise where protective clothing will be required to protect the wearer from the hazards of handling or using chemicals, but a new eponymous draft International Standard ISO/DIS 10078, *Protective clothing designed to protect personnel against contact with liquid or solid chemical products*, is aiming to reduce the number of accidents directly attributable to chemical spills and splashes. It is not an easy task. The physical conditions in which the protective clothing will be worn, the type of work which may be undertaken, the duration of use and the many varieties of chemical agent one might encounter, present an almost infinite range of risks. A full audit of the risks involved must then necessarily remain the prerogative of the user or specifier.

The specifications therefore only seek to provide a range of materials that will provide the user with a selection of fabrics most likely to meet his needs. In this regard however, the specification provides a range of materials of varying degrees of robustness and physical properties which can be reviewed in comparison in a quick "one-stop shopping" document.

This draft International Standard specifies requirements for fabrics coated on one or both sides or for double texture fabrics in which a natural rubber or synthetic rubber, a polyurethane or silicone elastomer or a plasticized vinyl chloride or copolymer or vinyl chloride is used, and which are suitable for use in the manufacture of protective clothing to protect personnel against contact with liquid or solid chemicals.

Information contained in this draft International Standard will provide the necessary guidance and means of assessing and meeting the risks involved in a variety of workplaces and situations. A guide to selection and use is given in an annex. Those interested in this draft International Standard might also be interested in International Standard ISO 6530, *Protective clothing — Protection against liquid chemicals — Determination of resistance of materials to penetration by liquids*.



ISO/DIS 10078 on protective clothing aims at reducing injuries to personnel exposed to risk when handling or using chemicals.

Improvements in the sensitivity of negative films in recent years have been aimed at the amateur wanting very high quality pictures.

Chemicals for photographic processing

In 1912, the German chemist Rudolf Fischer discovered that dyes could be obtained by oxidation or coupling with other chemical substances. All modern colour films follow this general principle. However, it took some time to move into the modern world of a wide choice of quality films.

In 1936, the German company Agfa developed the first reversal film, Agfacolor. It had colour couplers present in the emulsion. Substractive colour synthesis then spread all over the world and improvements were made in rapid succession: in 1939, the Agfacolor negative/positive film was introduced.

Six years later in 1942, the United States responded with Kodacolor. Market forces ensured that the reversal and negative/positive processes continued to evolve in parallel. The former producing Ektachrome (1945), Anscochrome (1955) and Fujicolor (1948); the latter, Ektacolour (1947) and the Gevacolor. In 1949 a new generation of Kodacolor films and in 1953 Agfacolor, applied a technique using oclour "masks" which gave better colour saturation.

In addition to its Kodacolor range, at the end of 1988, Kodak introduced the Ektar 25 and 1000, two types of negative films for print making, aimed at the amateur wanting very high-quality pictures.

The latest generation colour emulsions can be said to have begun in 1983 when Kodak developed the renowned "T" grain which heralded an amazing improvement in sensitivity. This grain made it possible to raise the sensitivity of Kodacolor negative films to ISO 1000. There is also a major improvement for reversal films and the new Ektachrome comes with ISO 400, ISO 1600 and even ISO 3200, which makes it the most sensitive "daylight" film produced.

Other companies feature developments of a like kind. Agfa (use of structured twin crystals) and Fuji (double structure grain SG and Fujicolor that can be used at ISO 3200).

Now ISO Technical Committee TC 42, *Photography*, has developed a new draft International Standard to ensure that the photographic industry continues to develop through the 1990s, ISO/DIS 418, *Photography — Processing chemicals — Specification for anhydrous sodium sulfite,* is one of a series of International Standards that establishes criteria of purity for chemicals used in processing photographic materials. General test methods and procedures cited in this International Standard are compiled in ISO 10349, *Photography — Photographic grade chemicals — Test methods*.

Criteria are considered the minimum requirements necessary to assure sufficient purity for use in photographic processing solutions.

This International Standard is intended for use by individuals with a working knowledge of analytical techniques. Some of the procedures utilize caustic, toxic, or otherwise hazardous chemicals. Safe laboratory practice for the handling of chemicals requires the use of safety glasses or goggles, rubber gloves and other protective apparel, such as face masks or aprons, where appropriate. Normal precaution required in the performance of any chemical procedure and some detail has been expended on appropriate warnings.

TC42 was formed in 1947 and is tasked with standardization of definitions, dimensions and recommended practice in the field of photography (specifically radiation sensitive recording media and their utilization); methods for testing, rating and classifying the performance characteristics of materials and devices used in photography; and methods, materials and processes used for photographic document and reproduction.

A picture, they say, is worth a thousand words. Nonetheless, this draft International Standard which is a revision of International Standard ISO 418, first issued in 1976, should find a devoted audience who need to get the picture every time.

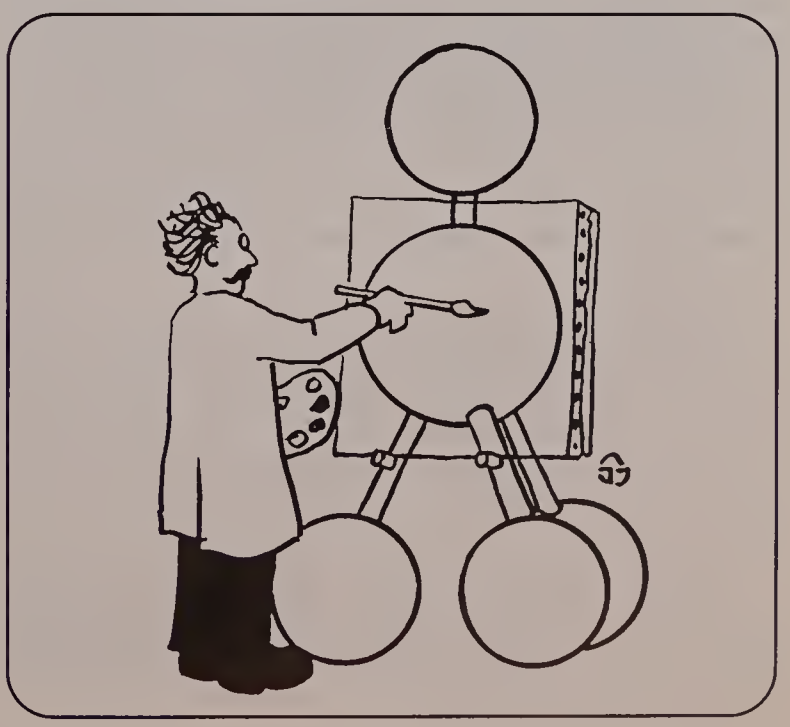
The above items on `Protective clothing' and `Chemicals for photographic processing' are reprinted from iso bulletin ***8,*** *1992, with permission.*

Fire in Santiago: request for help

The chemistry building at the University of Santiago, Chile, was completely destroyed by fire last year — from the ground floor to the top floor. All research laboratories and scientific equipment were destroyed.

IUPAC Past-President Yves Jeannin has passed on a request from Mrs Spodine (Faculty of Pharmacy) for old unused equipment which could be donated to colleagues in Chile. They wil support the transportation expenses.

Please write directly to Mrs Spodine, Faculty of Pharmacy, University of Santiago, Chile.



The Surrey symposium reviewed the current states of the risks entailed in the manufacture, handling and use and disposal of chemicals.

Risk management of chemicals

Delegates from 30 countries attended the International Symposium on Risk Management of Chemicals — Can Chemicals Be Used Safely? held at the University of Surrey, Guildford, UK, on 13–16 July 1992, and organized by the Royal Society of Chemistry (RSC) and sponsored by IUPAC.

Mervyn Richardson, Chairman of the RSC Toxicology Subject Group, reports that in addition to lectures from speakers from America, China and Western Europe, delegates were privileged to hear addresses from senior representatives from a number of the United Nations Agencies, including: United Nations Environment Programme (UNEP), International Labour Organization (ILO), World Health Organization (WHO) and United Nations Industrial Development Organization (UNIDO). High level contacts were forged with the Federation of the Russian States. Delegates from Central and Eastern Europe enlarged upon the problems which beset these countries.

The symposium reviewed the current states of the risks entailed in the manufacture, handling, use and disposal of chemicals on which we all depend and proposed a series of further actions that are necessary for the protection of both the workplace and the natural environment.

In the quest for professional risk management it was stressed at this, the first international conference on the subject since the Earth Summit in Rio de Janeiro, that actions to prevent environmental catastrophes were necessary on a global basis, and that account must be taken of the critical pathways and mechanisms involved to protect both human and national resources, including land, marine and fresh water, air, climates, biological diversity, together with living and working conditions.

There are enormous economic and social benefits obtainable from chemicals and these must be considered in perspective with the risks. Risk management, as undertaken by professionals, must never mislead the public over the real trade-offs necessary between risks, costs, and benefits, and hence distort priorities, particularly so in managing the global environment.

Chemists must now consider implementation of product stewardship and duty of care from cradle to grave. It was also proposed that a further conference in this highly acclaimed series should be organized.

Chemistry, agriculture and the environment

An IUPAC-sponsored International Conference on Chemistry, Agriculture and the Environment was held at the University of Surrey, Guildford, UK, on 16–18 July 1992. The conference was organized by the Robens Institute of the University of Surrey in collaboration with the Royal Society of Chemistry (RSC). The conference attracted a truly international audience, according to Mervyn Richardson, Chairman of the RSC Toxicology Group. The conference had orginally been planned to be held in Poland in September 1990, but circumstances did not permit this.

Richardson reports that speakers discussed a number of relevant topics, including: impact of agriculture on wild plants and animals in Great Britain, sources of information, pollution of the biosphere from both fertilizers and pesticides. The conference concluded with discussions on human health effects.

A number of interesting points emerged from the discussion including the need for scientists to communicate better with politicians and public alike, a dramatic increase in the need for improvements in duty of care, and the need for a cradle to grave approach, utilizing the concepts of good risk management techniques.

The challenge for the future has to include an acceptable compromise between the interests of humanity and the integrity of the biosphere on which future generations will have to depend.

World's fastest printer

The world's fastest printer is the Radiation Inc., electrosensitive system at the Lawrence Radiation Laboratory, Livermore, California, USA. High-speed recording of up to 30 000 lines per minute, each containing 120 alphanumeric characters, is attained by controlling electronic pulses through chemically-impregnated recording paper which moves rapidly beneath closely spaced fixed styluses. It is so fast that it can print the Bible (773 692 words) in 65 seconds. (*iso bulletin,* **23**, 6, June 1992.)

Electronic mail at IUPAC Secretariat in Oxford

The IUPAC Secretariat in Oxford now has electronic mail. The E-mail address is:

IUPAC@UK.AC.OXFORD.VAX

On or *about* thin diamond films

In one of its subscription fliers, the journal *Carbon*, published by Pergamon Press in Oxford, UK, stated that it 'encourages the submission of papers *on* thin diamond films.' It later transpired that the journal was actually encouraging submission of papers *about* diamond films and other unusual carbonaceous materials.

Inauguration of Asian Federation for Medicinal Chemistry

The IUPAC Section on Medicinal Chemistry has been making efforts over several years to set up the Asian Federation for Medicinal Chemistry (AFMC). The Federation was finally inaugurated last year with the support of 9 societies in Asia.

The Foundation Meeting was held at the Nagai Memorial Hall of the Pharmaceutical Society of Japan, Shibuya, Tokyo, on 11 May 1992. The 9 Founding Members are: The Royal Australian Chemical Institute, Chinese Pharmaceutical Association, Chinese Pharmaceutical Industry Association, Korean Chemical Society, The Pharmaceutical Society of Korea, Japanese Society for Bioscience, Biotechnology and Agrochemistry, The Chemical Society of Japan, The Pharmaceutical Society of Japan, and The Society of Synthetic Organic Chemistry, Japan.

Societies from other countries such as India and New Zealand are expected to join later. Dr Naofumi Koga, who is Vice-President of the IUPAC Medicinal Chemistry Section, was elected President of AFMC, Dr Jung Bog Chae (Korea) President-Elect and Dr Shigeru Takanashi (Japan) Secretary General — all for terms of two years.

Dr Naofumi Koga speaking at the inaugural meeting of AFMC.

Names and Addresses

Full details (names, addresses, telephone/telex/fax numbers) of commission and committee chairmen and secretaries and IUPAC officers were published in *Chem. Intl.* **13**, 223-233 (1991). The IUPAC Secretariat has been notified recently of the following changes:

Dr A Dieffenbacher (Chairman, Commission on Oils, Fats and Derivatives). Nestec Ltd, Research Centre, Vers-chez-les-Blanc, PO Box 44, CH-100- Lausanne 26, Switzerland. Tel: +41 (21) 785 8397. Fax: +41 (21) 785 8553.

Prof. A. Hulanicki (President, Analytical Chemistry Division). Fax: +48 (22) 22 59 96.

Prof. K. L. Komarek (President, Inorganic Chemistry Division). Fax: +43 (1) 310 45 97.

Dr J. Stejskal (Secretary, Commission on Polymer Characterization and Properties). Institut für Polymere, ETH-Zentrum, Universitätstrasse 6, CH-8092 Zürich, Switzerland. Tel: +41 (1) 256 3038. Fax; +41 (1) 251 4633.

Dr J. G. Topliss (President, Medicinal Chemistry Section). Tel: +1 (313) 763 4998.

We regret to record the deaths of

Prof. J.C. Bailar, Jr, USA (17 October 1991) — Treasurer of IUPAC (1963-71)

Prof. J. Jordan, USA (14 August 1992) — Commission on Electrochemistry (1965–71), Commission on Physicochemical Symbols, Terminology, and Units (1969–73), Commission on Electroanalytical Chemistry (1971–87), Analytical Chemistry Division Committee (1987–91).

Prof. H.F. Mark, USA (6 August 1992) — Commission on Macromolecules (1947–61)

Prof. M. Mikhaylov, Bulgaria (14 April 1992) — Commission on Polymer Characterization and Properties (1987–92)

Prof. G.J. Patriarch, Belgium (11 March 1991) — Commission on Analytical Nomenclature (1987–89), Commission on General Aspects of Analytical Chemistry (1989–91).

Prof. L.B. Rogers, USA (31 March 1992) — Commission on Equilibrium Data (1967–73), Commission on Analytical Nomenclature (1975-79).

Prof. G. Snatzke, FRG (14 January 1992) — Subcommittee on Chiroptical Phenomena/Commission on Molecular Structure and Spectroscopy (1977-83)

Prof. J. Starý, Czechoslovakia (3 October 1991) — Commission on Equilibrium Data (1969–1983), Commission on Analytical Nomenclature (1981–89)

Dr J.K. Taylor, USA (26 March 1992) — Commission on Electroanalytical Chemistry (1969–73).

Affiliate Affairs

International standards

CI regularly publishes news items about international standards relating to chemistry and lists of these standards published by the International Organization for Standardization (ISO). For further information about ISO and their publications please contact: ISO Secretariat, 1 Rue de Varembé, Case Postale 56, 1211 Geneva 20, Switzerland. Tel: +41 (22) 749 0111. Fax: +41 (22) 733 3430. Telex 412205 ISO CH.

Adsorption from solution at the solid/solution interface

Professor Douglas Everett has available two or three dozen reprints of the report 'Reporting Data on Adsorption from Solution at the Solid/Solution Interface.' If you would like one of these, please contact him at: *School of Chemistry, University of Bristol, Cantock's Close, Bristol BS8 1TS, UK. Tel: +44 (272) 303030. Fax: +44 (272) 251295.*

IUPAC publications

Affiliates are entitled to a 25% reduction and in some cases a 40% reduction on the cost of IUPAC publications except the scientific journal *Pure and Applied Chemistry*. A leaflet detailing IUPAC books currently available from Blackwell Scientific Publications has recently been distributed by the publishers to all *CI* readers. Further copies may be obtained from the IUPAC Secretariat.

Ties and scarves

IUPAC ties and scarves may be purchased from the IUPAC Secretariat by applying to the Affiliate Affairs Secretary. The colours for both are *either* maroon *or* navy (dark) blue. The ties cost USD 14.00/GBP 7.00 each and the scarves USD 12.00/GBP 6.00 (including postage and packing).

Please use the form (or a photocopy of it) published on page 170 of the September 1992 issue of *CI*. Alternatively please write to the Affiliate Affairs Secretary with your order stating the colour you require. A cheque made payable to IUPAC for the appropriate amount should be enclosed with your order.

How to contact commissions

IUPAC affiliates are entitled to communicate directly on scientific matters with the officers of IUPAC comissions. A full list of names and addresses of all commission officers for 1991–93 was published on pages 223–233 of the November 1991 issue of *CI*. Photocopies of this list are available upon request from the Affiliate Affairs Secretary.

Address of IUPAC Secretariat

Please use the following address for all communications directed to the IUPAC Affiliate Affairs Secretary. If you are submitting a letter for publication in *Chemistry International* (*CI*), please indicate that the letter is 'Submitted for publication in *CI*.'

Affiliate Affairs Secretary
IUPAC Secretariat
Bank Court Chambers
2-3 Pound Way
Templars Square
Cowley
Oxford OX4 3YF
UK

Tel: +44 (865) 747 744
Fax: +44 (865) 747 510
Telex: 83147 VIA OR G attn. IUPAC
E-mail: IUPAC@UK.AC.OXFORD.VAX

IUPAC-sponsored conferences

If you are interested in attending a conference please apply directly to the conference organizers for the conference circulars and registration forms. An updated list of names and addresses of the organizers of all future IUPAC-sponsored conferences is given in the 'Conference Calendar' published in each issue of *CI*.

Affiliate reduction of conference registration fees

It is a condition of IUPAC sponsorship of a conference that IUPAC affiliates are entitled to a 10% reduction or 'own members' rate on the registration fee for scientific participants. This concession is usually – but not always – announced in the conference circulars and indicated on the registration form.

To receive this reduction an affiliate must declare on the conference registration form that (s)he is an affiliate. Alternatively the affiliate should apply in writing to the conference organizer for this reduction stating that (s)he is an affiliate. Conference organizers may check with the IUPAC Secretariat that applicants for this reduction are currently registered as affiliates.

If an application for this reduction is refused, an affiliate should immediately notify the Affiliate Affairs Secretary and, if possible, forward copies of documentary evidence of this refusal

Commission & Committee News

Practical photochemistry for students

Much of the work of the Commission on Photochemistry (III.3) over the past decade has been in 'traditional' IUPAC areas such as defining terms and symbols or recommending standard procedures. At its meeting on 21–23 July 1992 held in Leuven, Belgium, the Commission learnt of the approval for publication of a collection of photochemistry experiments designed to introduce undergraduate students to this interdisciplinary subject and to be accessible in higher education institutions whose materials and equipment resources are limited.

Many experiments were collected from a range of courses, principally in Japan, the USA and western Europe. A coherent selection was made and these were edited to a reasonably consistent pattern without removing the authors' individual styles.

Initial publication in the September issue of *Pure and Applied* (see page 14) will be followed by a validation exercise undertaken by the Committee on Teaching of Chemistry and eventual revision in a format for wider dissemination.

Other activities underway are an expansion of the Glossary of Terms used in Photochemistry, a translation of the original Glossary into Spanish, a project dealing with methods for analysing kinetic data from transient absorption measurements, and consideration of work in the fields of photocatalysis, photopolymerization and elementary level education in photochemistry.

There was an unusually large proportion of members attending this Commission meeting (17, plus 3 other photochemists by invitation), because the meeting was arranged during the IUPAC-sponsored 14th International Symposium on Photochemistry (see page 14). The involvement of many National Representatives was particularly appreciated.

The next meeting of the Commission will be held in Lisbon, Portugal, on 6–8 August 1993.

John Coyle

Polymer terminology

At its meeting in Zurich on 20–24 July 1992, the Commission on Macromolecular Nomenclature (IV.I) substantially advanced several of its projects. Besides four projects that are nearing completion, notable progress was made to define terms used in polymeric and low molar mass liquid crystals, to develop and revise definitions of basic terms used in polymer science, and to define terminology and nomenclature for non-linear polymers and polymer assemblies.

When the Commission began its work in 1987 to define terms used in liquid crystalline polymers, it discovered that no effort had been expended by any international body to reach agreement on the definitions of terms used low molar mass liquid crystals. Undaunted by this obstacle and with the support of experts in low molar mass liquid crystals, the Commission's working party has developed basic definitions for the low molar mass species to serve as the foundation for its efforts to define liquid crystalline polymer terminology. At this year's meeting, the Commission agreed upon definitions for such basic terms as *mesomorphic state*, *mesophase*, *liquid crystalline state*, *liquid crystal*, *mesomorphic glass*, *lyotropic*, and *thermotropic*. Along with these, more than one-hundred other terms and have been defined in sections on basic definitions, structures, textures and defects, properties, and liquid crystalline polymers. Once modifications agreed upon at the Zurich meeting are made, a draft of this document will be sent to experts on both polymer liquid crystals and low molar-mass liquid crystals for comment.

The basic terminology of polymer science was the subject of one of the Commission's first publications, *Basic Definitions of Terms Relating to Polymers (Recommendations 1974)*. Since that time, many new terms have entered the vocabulary and it has become recognized that some very fundamental terms were overlooked in the original publication. To address the growth in terminology and to rectify past oversights, the Commission is developing a glossary of basic terms. Recent discussions of the Commission reached agreement upon many well-used but previously undefined fundamental terms, e.g. *macromolecule*, *chain*, and *crosslink*, which have not previously been defined. Terms that have become commonplace since the 1974 document, e.g. *macromonomer*, *star macromolecule*, *comb macromolecule*, *ionomer*, and *interpenetrating polymer network*, will also be included.

The form of the document on *Nomenclature for Non-Linear Polymers and Polymer Assemblies* was agreed to by the Commission. It contains about thirty terms and nine rules for their use. Once the modifications suggested in Zurich have been incorporated, the document will be sent to outside experts and to Interdivisional Commission on Nomenclature and Symbols (IDCNS).

Commission IV.1 in Zürich.

The Commission's project Nomenclature of Regular Double-Strand (Ladder and Spiro) Organic Polymers has completed its eight-month public review period and will be prepared for publication shortly. The nomenclature is intended to provide unambiguous, structure-based names for macromolecules formed by an uninterrupted sequence of rings with adjacent rings having one atom in common (spiro polymer) or two or more atoms in common (ladder polymer).

Three other projects of the Commission, *Basic Classification and Definitions of Polymerization Reactions*, *Structure-Based Nomenclature for Irregular Single-Strand Organic Polymers*, and *Graphic Representations of Macromolecules* will soon be opened to public comment after minor changes agreed to by the Commission after consideration of comments by IDCNS are made.

Also in progress in the Commission are projects to revise the Commission's 1976 publication *Nomenclature of Regular Single-Strand Organic Polymers*, to define the terminology used to describe polymer degradation, stabilization, and aging, and to define the terminology used to describe the elastic, viscous, and viscoelastic properties of polymers.

The next meeting will be held in Lisbon, Portugal on 5–9 August 1993.

Dr William J. Work

Nomenclature in molecular analysis

The status of the various nomenclature documents currently in preparation by the Commission on Spectrochemical and other Optical Procedures for Analysis (V.4) was discussed at its meeting in Würzburg, Germany, on 4–5 September 1992.

Part IX: Instrumentation for Dispersion, has been sent to Commission Secretary Dr A. M. Ure for re-submission to the Interdivisional Committee on Nomenclature and Symbols. The status of Part XI: Detection of Radiation was reviewed. Dr Moore will prepare a synopsis and submit this part through Commission Chairman Dr T. Vo-Dinh to the Division.

Four of the nomenclature documents on laser-based spectroscopy were discussed. A revised draft of Part XV was reviewed in detail. Dr Moore will circulate a new draft incorporating the changes for comments by Commission members. Parts XVIII, XXI and XXII (not yet official) were reviewed and new drafts will be prepared by Prof. Schrader, Dr Coufal and Prof. Gauglitz respectively, for the Lisbon meeting. The attendees also concluded that all the documents on laser-based molecular spectroscopy should be prepared contemporaneously because of their interdependence.

The scope of the Commission's programme after Lisbon was also discussed.

The next meeting of the Commission will take place during the General Assembly in Lisbon.

Dr David S. Moore

Chromatography and analytical separations

Although the meeting in July 1992 of the Limited Life time Commission on Chromatography and other Analytical Separations started with the colourful and melodic opening ceremonies of the 3rd Veszprem Singing Week, the members of the Commission were soon at work in the elegant headquarters of the Transdanubian Section of the Hungarian Academy of Sciences which forms part of the old castle area of this historic city, now a centre of the Hungarian chemical industry.

The Commission reviewed the progress that had been made since its creation three years previously. Although as a LLTC it was due to complete its work at the General Assembly meeting in Lisbon in 1993, the Chairman, Prof. Peter Uden reported that strong representations would be made for its continuation and if possible its establishment as a full Commission in the Analytical Division. This continuation would be justified by the importance of chromatography as one of the major analytical techniques widely used throughout chemistry and the chemical industry and therefore the need for an accepted nonmenclature and the active development of standardized techniques and methods.

The Commission heard that a major paper on Chromatography Nomenclature prepared by Prof. Leslie Ettre should shortly be completed and submitted for publication. Further nomenclature papers covering supercritical fluid chromatography and extraction prepared by Dr Roger Smith and on pyrolysis in chromatography prepared by Prof. Uden were in the review process. Proposals for additional nomenclature projects, covering hyphenated detection and non-linear chromatography were accepted by the Commission for future development.

The Commission also laid the foundations of two series of projects on stationary phases and on mobile phases for liquid chromatography. The initial projects would consider the terminology to be used and a paper to be prepared by Dr Aurel Marton on methods for the characterization of ion-exchange stationary phase.

The Commission was now also responsible for a detailed paper on the nomenclature for liquid-liquid distribution which had been prepared by Dr Mick Leonard initially for Commission V.1 and this was well into the review process.

A useful paper was presented for discussion which described work being carried out by the Analytical Instruments Association (USA) in conjunction with ISO and ASTM on the development of standards for the interchange of data between chromatographic systems and databanks.

During the meeting the Commission members were pleased to receive a visit from Prof. Janos Inczedy, of the University of Veszprem, who is the National Representative for Hungary on Commission V.1 and had previously been associated with some of the projects which the Commission was developing.

The next (and it is hoped not the final) meeting of the Commission will be held in Lisbon on 6–8 August 1993.

Dr Roger M. Smith

Equilibrium data

The even-year meeting of the Commission on Equilibrium Data (V.6) was held in Lausanne, Switzerland during the 29th ICCC on 19 July 1992.

The Commission surveyed its recent activities, discussed again its place in a revised IUPAC structure and agreed on the following high priority activity areas for the next 4–6 years:

1. Completion of the Stability Constant Data Base for the period 1974–89 in order to prepare a marketable product; the

maintenance (continuous collection of the recent data) of the Data Base and production of updated versions.

2. The continuation of the projects as the critical survey of stability constant of metal complexes of important ligand classes.

3. The critical survey of the various experimental techniques suitable for the determination of stability constant; evaluation of the methods and recommendations for their applicability

4. Demonstration of the many uses of equilibrium constants (also microconstants and site-constants giving information at molecular level) beyond coordination chemistry; e.g. in environmental chemistry, bioinorganic chemistry, biochemistry, pharmacology, etc.

Satisfaction was expressed at the completion of two projects during the past year. These have been sent to the Division, while one was distributed for review among the Commission members.

One new project on the critical survey of the thiocyanato complexes was initiated and is to be submitted to the Division for assessment.

Following a preliminary study, a project on the use of different pH-scales in practical pH-metry was discussed in detail.

In view of the IUPAC desire for subcommittees to complete their tasks, the Commission agreed that the Subcommittee of Stability Constants should be dissolved from 1994 and that its very important tasks (see priority area 1) would be undertaken by Commission members.

The next meeting of the Commission will be held in Lisbon, Portugal, on 6–8 August 1993.

Prof. Dennis G. Tuck and Dr Tamas Kiss

Biotechnology

The Commission on Biotechnology (VI.2) met on 14–16 August 1992 just before the 9th International Biotechnology Symposium (IBS) in Crystal City, Virginia, USA. These conferences are sponsored by the Commission on behalf of IUPAC and take place every 4 years. They are a major event for biotechnologists from all corners of the globe.

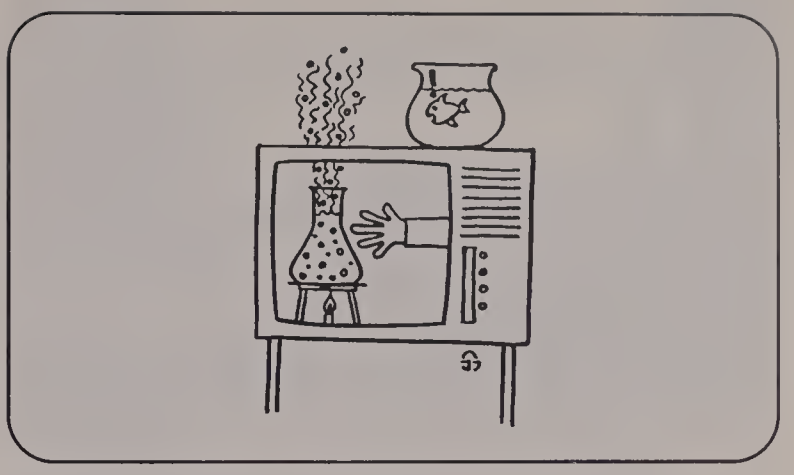
This year's meeting was organized by the American Chemical Society and was a great success. But the Commission has to look ahead. Sydney 1996 is still far away, but Peter Gray from the University of New South Wales presented the Australian Organizing Committee in good shape. So now we are thinking about the 11th IBS in the year 2000.

The Commission took pride in having 3 publications in *PAC* this year. Topics were: Glossary of for chemists of terms used in biotechnology (IUPAC Recommendations 1992); Interrelations of chemistry and biotechnology — III. Purification techniques for biological products (Technical Report); Selection terms, symbols and units related to microbial processes (IUPAC Recommendations 1992). It is good to have projects finalized.

Tasks were assigned to get our feasibility studies moving. These focus on the positive environmental contributions biotechnology can make and risk assessment.

The Commission is in good spirit and looking forward to its meeting in Lisbon, Portugal on 6–8 August 1993.

Heinz K. Kölbl



Water chemistry

The Commission on Water Chemistry (VI.6) held a meeting at Utrecht, The Netherlands on 14 September 1992. The Commission reviewed progress on each of its projects and feasibility studies.

The project on waste water treatability tests was terminated. The paper on leaching tests to assess pollution hazards to ground water is at the draft stage. The final version was expected by the end of September 1992. It will then be submitted for publication. No further progress was reported on the project concerning the use of amount and concentration units. With respect to the project on organics and metals in sewage sludge, relevant papers have been collected from Commission members and the drafting of a review paper is in hand.

A *Glossary of Terms Used in Water Chemistry* has been compiled and circulated to members. The final review is expected by May 1993. Publication of the proceedings of the workshop on pesticides was expected by the end of 1992.

A workshop on QSAR biodegradation is planned for March 1994. A decision on funding of this workshop was required from the Division Committee so that planning could proceed. A USD 15 000 bid was made to ICSU in 1992. Three speakers have already been identified and contacted. They are keen to participate. A position paper on the subject will be prepared by June 1993 for circulation to other Commissions when they meet at the General Assembly in Lisbon. The aim is to determine whether they have an interest in the workshop.

A questionnaire on immunoassays was circulated to members of the Commission on Water Chemistry. Some responses have been received and these will be collated for a review by the Commission in Lisbon. A review paper on the fate of CFC/halon substitutes is at the draft stage.

Concerning the feasibility study on oceanography and carbon dioxide, the Commission decided not to appoint oceanographers onto the Commission. Correspondence is underway concerning the future of the environmental fact sheets. Progress on the following feasibility studies was discussed at the Utrecht meeting: Standard methods and quality control; Sewage sludge and waste waters; Polar chemicals; Metal speciation models; Physico-chemcal data for environmental modles.

The next meeting of the Commission will be held on 6–7 August 1993 in Lisbon, Portugal, at the IUPAC General Assembly. A joint meeting with the Commission on Atmospheric Chemistry will also be organized at this time.

Dr Willie Peijnenburg

Conferences

Protein structure function relationship
Karachi, Pakistan
14–23 January 1993

IUPAC SPONSORED

The 3rd International Symposium on Protein Structure Function Relationship will be held at the H. E. J. Research Institute of Chemistry, University of Karachi, Pakistan.

The symposium will provide a forum for scientists from several countries for an exchange of scientific information, ideas and concepts. It will consist of 19 plenary and invited lectures, oral communications and a poster session. The main aim of the symposium is to gain knowledge of various aspects of protein structure function relationship which can improve our understanding of the nature of biologically active molecules.

The following are some of the lecture topics:

- Protein structure and design of novel molecules (T. Blundell, UK);
- Structure-function relationship of Interleukin-6 (R. J. Simpson, Australia);
- Structure-function relationship in ion channelling membrane proteins (J. B. C. FIndlay, UK);
- X-ray studies of metalloproteins in crystal and solution (S. Hasnain, UK);
- Protein crystallography at the interface of chemistry, physics and medicine (R. Huber, Germany);
- Polypeptide growth factors: structure function and mechanism of action (R. Bradshaw, USA);
- Development of subunit malaria vaccine: requirement for protein conformation (W. A. Siddiqui, USA);
- Amide hydrogen exchange and mass spectrometry: a probe for conformational changes in proteins (D. L. Smith, USA).

Malaria surveillance: a blood sample is taken near to a house where a positive case of malaria has been found. The development of subunit malaria vaccine is one of the topics of the Karachi symposium. *(WHO Photo by A. S. Kochar.)*

The symposium will be followed by a 10-day workshop on protein structure: chemical and physical aspects. The workshop will provide basic theoretical and practical knowledge in protein separation, sequencing and their physical aspects using modern techniques including computer graphics.

The official language of the symposium is English.

Recycling
Geneva, Switzerland
19–22 January 1993

IUPAC SPONSORED

The International Recycling Congress (ReC'93) will take place at the Re'93 International Recycling Trade Fair at the Palexpo conference and exhibition centre in Geneva, Switzerland, 19-22 January 1993. The congress is co-sponsored by IUPAC, the United Nations Environment Programme (UNEP), the Commission of the European Communities (EEC) and many other international trade associations and professional societies representing industry, trade, research and development agencies concerning with recycling.

ReC'93 aims to present and evaluate existing and future concepts and technologies relating to recycling. Leading experts, representing public authorities and institutions, industry, scientific research, and academia will address many aspects of the recovery and reuse of secondary raw materials and energy.

ReC'93 will open with a plenary session on concepts and legislation, putting recycling into perspective with regard to resource availability, waste management, and environmental care. The following days will be devoted to concurrent sections on the following themes: automotive; building and civil engineering wastes; chemicals, oil and solvents; composting; energy recovery; glass; health care sector waste; metals, ferrous and non-ferrous; municipal solid waste; packaging; paper and board; plastics and rubber; textiles and fibres. Oral presentations will be in English, French or German with simultaneous translation between those languages.

Geneva is conveniently situated in the centre of Europe, with excellent rail and road connections to other major European cities and enjoys extensive worldwide air connections. Beautifully situated in the heart of Europe's most attractive lake and mountain regions. The city has over 100 centrally located hotels ranging from small inns to 5-star international establishments. The city offers extensive cultural, gastronomic, social , sporting and tourist attractions for delegates and their companions.

Colloquium Spectroscopicum Internationale
York, UK
20 June–4 July 1993

IUPAC SPONSORED

The 28th Colloquium Spectroscopicum Internationale (XXVIII CSI) will be held at the University of York, UK, from Tuesday 29 July to Sunday 4 July 1993. This traditional biennial conference provides a forum for the international community of analytical spectroscopists to meet and exchanges ideas. Contributions will be in English, French or German (there will be no translation facilities) on the following topics:

Basic theory, techniques and instrumentation of:
Atomic spectrosocpy (emission, absorption, fluorescence)
- Computer applications and chemometrics
- Electron spectroscopy
- Gamma spectroscopy
- Laser spectroscopy
- Mass spectrometry (inorganic and organic)
- Methods of surface analysis and depth profiling
- Molecular spectroscopy (UV, VIS, IR)
- Mössbauer spectroscopy
- Nuclear magnetic resonance spectrometry
- Photoacoustic spectroscopy
- Raman spectroscopy
- X-ray spectroscopy.

Application of spectroscopy in the analysis of:
- Biological samples
- Environmental samples
- Food and agricultural products
- Geological materials
- Industrial products
- Metals and alloys.

The scientific programme will consist of plenary lectures and four parallel streams of contributed lectures, each session beginning with an invited lecture from a prominent scientist in the relevant field. Separate times will be made available for poster session.

The following scientists have agreed to present keynote plenary lectures: M. L. Gross (Lincoln, NE); R. E. Hester (York); C. L. Wilkins (Riverside, CA) and J. D. Winefordner (Gainesville, FL).

A number of workshops and pre- and post-symposia will be organised in connection with XXVIII CSI. The conference will also feature an exhibition of the latest instrumentation.

The ancient City of York is full of attractions for the tourist: York Minster, the largest Gothic cathedral in Northern Europe; the Castle Museum, with reconstructed shops and domestic interiors; the Jorvik Viking Centre; the National Railway Museum, and many more. York has excellent shops, is a centre of the antiquarian book trade and, close to the City, country houses such as Castle Howard and Skipton Castle are open to the public. The Yorkshire moors are also near by.

The University lies two miles south east of the city walls and is set in a landscaped park. The focal point of this compact modern campus is the Central Hall which adjoins an ornamental lake and will be the venue for the plenary lectures. Accommodation has been reserved on campus in the halls of residence, although hotel accommodation in York will be available if desired.

The 18th International Symposium on Macrocyclic Chemistry will be held at the University of Twente, The Netherlands.

Macrocyclic chemistry
Enschede, The Netherlands
27 June–2 July 1993

IUPAC SPONSORED

The 18th International Symposium on Macrocyclic Chemistry (XVIII ISMC) will take place at the University of Twente, Enschede, The Netherlands.

The symposium will be a forum for scientists to discuss recent and future trends in macrocyclic chemistry, host-guest chemistrsy, supramolecular interactions and related topics. The scientific themes have been selected for their fundamental interest as well as for their industrial importance. The main topics are:
- Biomimetic chemistry
- Chemical sensors
- Computational methods
- Electrochemical processes
- Enzyme modelling
- Industrial applications
- Kinetic phenomena
- Membrane science
- Molecular catalysis
- Molecular materials
- Molecular modelling
- Molecular self-assembly
- Separation methods
- Structural studies
- Transport phenomena.

The programme will consist of 50-minute plenary lectures of invited speakers, a young scientist symposium that will give a number of young colleagues the opportunity to present their work in 20-minute short talks and poster presentations. The conference language is English.

The conference will be held on the campus of the University of Twente which is located in the Eastern part of The Netherlands in beautiful natural surroundings between Enschede and Hengelo. For accommodation, a limited number of rooms is available in the two hotels on campus. Other hotel accommodation will be available in Enschede, Hengelo and their surroundings.

The University campus is easily accessible by rail and motorway. There is a railway service from Schipol Amsterdam Airport to Enschede which runs every half hour. The Netherlands has a mild sea climate with temperatures in summer time ranging form 20 to 30°C.

The Samokov Hotel, Borovets, venue of the International Symposium on Cationic Polymerization and Related Ionic Processes, is located in the Balkan mountains.

Cationic polymerization Borovets, Bulgaria 4–7 July 1993

The 11th International Symposium on Cationic Polymerization and Related Ionic Processes will be organized by the Institute of Polymers, Bulgarian Academy of Sciences, and will be held in Borovets, Bulgaria, on 4–7 July 1993. The venue is a small town in Northern region of the Rila mountain, about 72 km from the Bulgarian capital, Sofia.

The symposium aims to gather scientists working in this field to discuss the recent problems of ionic polymerization. The meeting will consist of about 30 invited lectures of 30 minutes and also poster sessions. The main topics of the symposium will be:

- Recent developments in new cationic and anionic polymerizations.
- Controlled polymer synthesis and stereoregular effects.
- Block and graft copolymers.
- Functionalized polymers.
- Salt, solvent and additive effects.
- Industrial and biological applications.

All lectures will be presented in English.

The registration fees before/after 1 May 1993 will be: USD 300/350 for participants; USD 100/130 for students and USD 60/70 for accompanying persons. IUPAC affiliate members are entitled to a 10% reduction. An accompanying persons programme as well as excursions during and after the symposium will also be arranged.

The symposium will be held at the 4-star Samokov Hotel in the mountain resort of Borovets, but reservations in neighboring smaller hotels at reasonable prices will also be possible. The Samokov Hotel offers excellent facilities for the symposium activities: decent services including air conditioned conference rooms, restaurants with traditional Bulgarian and international cuisine, a shopping centre, indoor swimming pool and sauna. Its location allows short and full day trips in the mountains up to the highest peaks by a cabin lift, as well as visits to many other places of interest. The average summer temperature is 20–22°C but mornings and evenings are cool.

Mineral and organic functional fillers in polymers

The 2nd International Sumposium on Mineral and Organic Functional Fillers in Polymers (MOFFIS-93) will take place at the Facultés Universitaires Notre-Dame de la Paix in Namur, Belgium, from 13-16 April 1993. The symposium is sponsored by the Groupe Français de Polymères (GFP-SFC) and the Sociétés Royale Belge de Chimie.

Please direct enquiries to: Dr J. G. Fripiat, Laboratoire de Chimique Théorique Appliquée, Facultés Universitaires Notre-Dame de la Paix, rue de Bruxelles, 61, B-5000 Namur, Belgium. Tel: +32 (81) 72 45 51. Fax: +32 (81) 72 45 30.

Clinical chemistry

The 10th IFCC European Congress of Clinical Chemistry, EUROLAB 93, will be held at the Acropolis Convention Center in Nice, France, from 25-29 April 1993. IFCC is the International Federation of Clinical Chemistry - an Associated Organization of IUPAC.

The scientific programme includes a wide selection of novel themes, such as gene therapy, molecular biology, biology of transplantation and cell communication. Speakers will also be looking systematically at fundamental research from the point of view of its applications in clinical chemistry.

To obtain the preliminary programme of EUROLAB 93, please contact: Group SEPFI-TECHNOEXPO, 8, rue de la Michodière, 75002 Paris, France. Tel: +33 (1) 47 42 92 56. Fax: +33 (1) 42 66 14 28.

Column liquid chromatography

The 17th International Symposium on Column Liquid Chromatography will be held at the Congress Centre, Hamburg, Germany, on 9–14 May 1993. The symposium will highlight the major developments, achievements and important improvements in high performance liquid chromatography (HPLC). The symposium is being organized by Gesellschaft Deutscher Chemiker (GDCh), Fachgruppe Analytische Chemie, Arbeitskreis Chromatographie.

For more information please contact: Gesellschaft Deutscher Chemiker, Abteilung Tagungen, Postfach 90 04 40, Varrentrappstr. 40-42, D-6000 Frankfurt am Main 90, Germany. Tel: + 31 (69) 79 17 360. Fax: +31 (69) 79 17 475.

Residues of veterinary drugs in food

The EuroResidue II Conference on Residues of Veterinary Drugs in Food will be held in Velhoven, The Netherlands, on 3–5 May 1993. This is Event No. 180 of the Federation of European Chemical Societies (FECS).

For further details please contact: EuroResidue II, c/o Department of Food of Animal Origin, Faculty of Veterinary Medicine, University of Utrecht, PO Box 90.175, NL-3508 TD Utrecht, The Netherlands. Tel: +31 (30) 535365/535367. Fax: +31 (30) 532365.

Cereal science and technology in Africa

The International Association for Cereal Science (ICC) is an Associated Organization of IUPAC. Its 1992 ICC International Symposium will be held at the CSIR Conference Centre on the outskirts of Pretoria. The symposium will take place from Monday 10 May to Thursday 13 May 1993.

Cereals play a vital role in the nutritional well-being of all communities in Africa. To achieve their full development potential, the countries of Africa must set goals to expand, extend and optimize their cereal production, storage, distribution, processing and utilisation. The symposium will focus on the impact of cereal science and technology on a changing Africa in providing a consistent and adequate supply of cereals to its people.

The following general topics will be covered during the symposium:

- Plant breeding;
- Grain production and quality;
- Cereal processing: low and high technology;
- Storage and distribution;
- New developments in cereal technology;
- New developments in cereal science;
- Cereals and nutrition.

Provision is being made for poster sessions and discussion groups. The Chairman of the Organizing Committee is Dr P. S. Steyn (Division of Food Science & Technology, CSIR) who is President of the IUPAC Applied Chemistry Division.

Please address all correspondence and enquiries concerning the symposium to: The Co-ordinators C. 152, CSIR Conference Centre and Services, PO Box 395, Pretoria, 0001 Republic of South Africa. Tel: +27 (12) 12 841 3817/4617 (Celine Brown/Giselle Hastie). Fax: +27 (12) 841 2051/86 2856. Telex: 3 21312 SA.

What is the impact of cereal science and technology on a changing Africa? (*FAO photo by F. Paladini and CSIR photo.*)

Conference Calendar

Conference circulars and registrations forms for the IUPAC-sponsored conferences listed below may be obtained, upon request, from the names and addresses shown in italics.

1993

Thermodynamics of solutions and biological systems

3–6 January.
International Conference on Thermodynamics of Solutions and Biological Systems.
New Delhi, India.
Prof. J. C. Ahluwalia, Department of Chemistry, Indian Institute of Technology, Hauz Khas, New Delhi — 110016, India. Tel: +91 (11) 653 474/653 576 (office), +91 (11) 664 519 (home). Fax: +91 (11) 686 2037. Telex: 317 3087 or 316 1460 — IITD-IN.

Protein structure function

9–12 January.
3rd International Symposium on Protein Structure Function.
Karachi, Pakistan.
Prof. Z. H. Zaidi, H.E.J. Research Institute of Chemistry, University of Karachi, Karachi-75270, Pakistan.

Recycling congress

19–22 January.
International Recycling Congress.
Geneva, Switzerland.
ReC'93 Organizing Committee, Att.: Hroar R. Skov, Mikkel Bryggers Gade 10, DK-1460 Copenhagen K; Denmark. Tel: +45 33114122. Fax: +45 33133859

Characterization of porous solids

9–12 May.
3rd International Symposium on Characterization of Porous Solids (COP-111). Marseille, France.
Prof. J. Rouquerol, Centre de Thermodynamique et de Microcalorimetrie du CNRS, 26 rue du 141 ème RIA, 13003 Marseille, France.

Environment and analysis

11–13 May.
International Environment 93 and Analysis 93.
London, UK.
Mr M. L. Richardson, BASIC, 6 Birch Drive, Maple Cross, Rickmansworth, Hertfordshire WD3 2UL, UK.

Safety in chemical production

31 May–4 June.
2nd IUPAC Workshop on Safety in Chemical Production.
Yokohama, Japan.
Prof. K. Tamaru, Japan IUPAC Workshop Committee, c/o The Chemical Society of Japan, 1-5 Kanda-Surugadai, Chiyoda-ku, Tokyo 101, Japan. Tel: +81 (3) 3292-6161. Fax: +81 (3) 3292-6318. Telex: 02226198 CSJ J.

Bioorganic chemistry

6–10 June.
2nd International Symposium on Bioorganic Chemistry.
Fukuoaka, Japan.
Symposium Secretariat, 2nd International Symposium on Bioorganic Chemistry, Department of Chemical Science and Technology, Faculty of Engineering, Kyushu University 36, Higashi-ku, Fukuoka 812, Japan. Fax: +81 (92) 6321842.

Carotenoids

20–25 June.
10th International Symposium on Carotenoids.
Trondheim, Norway.
10 Carotenoid Symposium, SEVU Conference Office, N-7034 Trondheim, Norway. Tel: +47 (7) 59 52 46 Fax: +47 (7) 51 72 26.

Yokohama: venue of the 2nd IUPAC Workshop on Safety in Chemical Production.

How to apply for IUPAC sponsorship

To apply for IUPAC sponsorship, conference organizers should write to the IUPAC Secretariat (see inside back cover for address) requesting an Advanced Information Questionnaire (AIQ). Completed AIQs should be returned to the Secretariat preferably 2 YEARS and at least 12 months before the conference. Late applications will not be considered. Further information on granting of IUPAC sponsorship was published in *Chem. Intl.* **11** (1), 4–5 (1989).

Multiphoton processes

24–30 June
6th International Conference on Multiphoton Processes (ICOMP VI).
Québec, Canada.
Dr S. L. Chin, Faculté des Sciences et de Génie, Centre d'optique, photonique et laser, Université Laval, Pavillon Alexandre-Vachon, Cité universitaire, Québec, Canada GiK 7P4. Tel: 1 (418) 656-2454.

Macrocyclic chemistry

27 June–2 July
18th International Symposium on Macrocyclic Chemistry.
Enschede, Netherlands.
Dr J. F. J. Engbersen, Department of Chemical Technology, University of Twente, P.O. Box 217, 7500 AE Enschede, The Netherlands. Tel: +31 (53) 892926. Fax: +31 (53) 356024.

Spectroscopy

29 June–4 July
18th Colloquium Spectroscopicum Internationale.
York, UK.
XXVIII Colloquium Spectroscopicum Internationale, Department of Chemistry (CSI Secretariat), Loughborough University of Technology, Loughborough, Leicestershire, LE11 3TU.

Cationic polymerization

4–7 July
11th International Symposium on Cationic Polymerization and Related Ionic Processes.
Borovets, Bulgaria.
Dr I. V. Berlinova, Institute of Polymers, Bulgarian Academy of Sciences, 1113 Sofia, Bulgaria. Tel: +359 (2) 700138/7133663. Fax: +359 (2) 707523. Telex: 22729 echban bg.

Boron chemistry

11–15 July
8th International Meeting on Boron Chemistry (IMEBORON VIII)
Tennessee, USA.
IMEBORON VIII, University of Tennessee Conference Center, PO Box 2468, Knoxville, TN 37901-2648, USA. Tel: +1 (615) 9740250. Fax: +1 (615) 9740268.

Optics and dynamics of polymers

12–15 July
33rd Microsymposium on Macromolecules, Optics and Dynamics of Polymers.
Prague, Czechoslovakia.
33rd Microsymposium, P.M.M. Secretariat, c/o Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, 162 06 Prague 6, Czechoslovakia. Tel: +42 (2) 360317. Fax: +42 (2) 367981. Telex: 122019 IMCP C.

Fluorinated monomers and polymers

19–22 July
34th Microsymposium on Macromolecules, Fluorinated Monomers and Polymers.
Prague, Czechoslovakia.
34th Microsymposium, P.M.M. Secretariat, c/o Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, 162-06 Prague 6, Czechoslovakia. Tel: +42 (2) 360317. Fax: +42 (2) 367981. Telex: 122019 IMCP C.

Harmonization of internal quality assurance schemes

26–29 July
5th International Symposium on the Harmonization of Internal Quality Assurance Schemes for Analytical Laboratories.
Washington, DC, USA.
Dr Michael Parkany, ISO Central Secretariat, Case postale 56, CH-1211 Genève 20, Switzerland.

Heterocyclic chemistry

1–6 August
14th International Congress on Heterocyclic Chemistry.
Antwerp, Belgium.
Prof. F. C. Alderweireldt, Antwerp University, Groenenborgeriaan 171, B-2020 Antwerp, Belgium.

IUPAC General Assembly

5–12 August
37th IUPAC General Assembly.
Lisbon, Portugal.

The IUPAC General Assembly is not open for general participation but is restricted to members of IUPAC bodies that meet on this occasion.

Centre of Lisbon

Chemistry International

1993, Vol. 15. No. 1 (January)

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The news magazine of the International Union of Pure and Applied Chemistry (IUPAC)

IUPAC

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Front cover: Cell line at Thunder Bay, Ontario, Canada. ERCO Industries Ltd (a Division of Albright and Wilson) uses modern metal electrode technology for the production of sodium chlorate.

Chemistry and sustainable development

CHEMRAWN VIII — The World Conference on Chemistry and Sustainable Development: Towards a Clean Environment, Zero Waste and Highest Energy Efficiency — was the 8th in the continuing series of conferences devoted to Chemical Research Applied to World Needs (CHEMRAWN). The conference was held in Moscow, Russia, on 6–9 September 1992. *CI* Editor Mike Freemantle reports.

Introduction

The objectives of CHEMRAWN VIII were to:

- Analyse the present state and define the requirements for the development of selected branches of industry-based on chemical processes in the framework of a sustainable development strategy.
- Help in the dissemination of information on clean technologies and on using waste as a raw material.
- Recognize scientific achievements that can lead to revolutionary technologies in chemical production, pollution prevention, waste recycling and use, and stimulate international collaboration in such areas.
- Elaborate strategic recommendations for policy and decision-makers on the development of the branches of industry which have the most perceptible impact on the environment and on the health of population.

Hotel Uzkoye, Moscow, venue of CHEMRAWN.

The conference was seen as a follow-up activity to the United Nations Conference on Environment and Development (UNCED). About 150 scientists including 50 or so from abroad attended the conference. Some 44 plenary lectures and a number of contributed posters were grouped into four sessions on the following themes:

A. Policy and strategy of moving to sustainable development.
B. Goals of chemistry and chemical branches of industry on the way towards sustainable development. Cleaner chemical technologies.
C. Recent state and technological achievements of chemical branches of industry.
D. New approaches to waste treatment and elimination of large-scale environmental pollutions.

Previous CHEMRAWN Conferences

CHEMRAWN I	Future sources of organic raw materials. Toronto, Canada, 1978.
CHEMRAWN II	Chemistry and world food supplies: the new frontiers. Manila, Philippines, 1982.
CHEMRAWN III	Resources material conversion. The Hague, Netherlands, 1984.
CHEMRAWN IV	Modern chemistry and chemical technology applied to the ocean and its resources. Keystone, Colorado, USA, 1987.
CHEMRAWN V	Current and future contributions of chemistry to health. Heidelberg, FRG, 1986.
CHEMRAWN VI	Advanced materials for innovation in energy, transportation and communications. Tokyo, Japan, 1987.
CHEMRAWN VII	The chemistry of the atmosphere: Its impact on global change. Baltimore, USA, 1991.

Policies and strategies

CHEMRAWN VIII was opened on Monday morning, 7th September 1992, with CHEMRAWN Chairman, Alan Hayes, acting as the Official Representative of IUPAC. The plenary lectures that morning focused on policies and strategies needed to move towards sustainable development.

Kirill M. Dyumayev (Deputy Minister of Science, Higher Education and Technical Policy of Russia) spoke about 'Achievements and problems in the chemical industry of Russia'. He pointed out that the current transition to the market economy in Russia gives rise to many general economic problems bearing on the further development of the chemical industry. He cited as examples the determination of various aspects of policies in structural investments, research and development, and funding.

The chemical industry in Russia is complex and diverse. In the former USSR it accounted for the production of about 76% of all industrial goods and some 61% of production assets. Dyumayev quoted figures suggesting that the devel-

CHEMRAWN VIII opening ceremony: about 150 scientists and industry leaders from 14 countries attended the conference.

opment of chemical industry in Russia is now stagnant. Output of a number of chemical products dropped from between 3% and 25% in 1991 and 1992.

The principal reasons for this reduction of output are, he said, the critical state of the Russian economy, radical limitations of centralized investments, the closures of a number of chemical plants, curtailed imports of raw materials and equipment, high wear of main assets and equipment and disruption of traditional relations between manufacturers.

The Deputy Minister pointed out that technical standards of the chemical industry do not meet modern international requirements and that much equipment is now out-dated. Replacement of such equipment takes two to three times as long compared with the world average.

On the other hand, Russia is a country that is rich in all kinds of chemical raw materials and energy. Over 72% of all research and technical potential of the chemical industry of the former Soviet Union is located in Russia. As the country moves to a market economy, scientists, business people and policy makers are beginning to develop an open and independent economic system embracing the commercialization of scientific, technical and industrial potential and the formation of a market strategy, infrastructure and mechanisms for competition.

In the same session, Herbert Eleuterio (Du Pont Chemicals, Wilmington, Delaware, USA) presented a lecture on 'Resolving society/technological environmental problems'. He said that the term 'environmentalism' may be defined as a widespread desire shared by many people for a clean, safe and sustainable environment.

Eleuterio thought that environmental problems tend to be made of conflicting interactive quantifiable and non-quantifiable components. Many environmental problems have taken on global dimensions and have become increasingly value-laden. Resolving value-laden environmental problems in a timely and affordable manner will require integrative approaches as well as significant changes in human behaviour. He discussed several approaches for the resolution of these issues.

Efficient use of energy in the chemical industry

The Monday afternoon session, and all day Tuesday were devoted to the theme 'Goals of chemistry and chemical branches of industry on the way towards sustainable development — cleaner chemical technologies'.

In the Monday afternoon session, Kunio Yoshida (University of Tokyo, Japan) lectured on 'Efficient use of energy in the chemical industry'. He said that the objective of energy conservation is, in response to world-wide instability and the rising prices of energy supply, to reduce the increase of energy demand as much as possible without damaging long-term economic growth.

The chemical industry aims to rationalize energy use by improvement of production facilities and by developing innovative manfuacturing processes. Yoshida then described an energy flow analysis that revealed the quantity and location of energy loss. He provided a systematic method for the analysis of chemical processes based on this energy concept.

Yoshida pointed out that, following the oil embargo, Japanese chemical industry has made intensive efforts to use energy efficiently. He stressed, however, that global-scale environmental issues are becoming increasingly serious — e.g. the problems of global warming resulting from the emission of greenhouse gases. He described certain counter measures that can be taken, for example, the use of chemical heat pumps and cascade systems for using energy.

Pollution reduction in the US

IUPAC affiliate Allan M. Ford (Monsanto, Environment Science Center, St. Louis, USA) delivered a lecture on 'Pollution reduction at a major US chemical manufactuing company'. He explained that a major US chemical manufacturer began a program to reduce releases to the environment of regulated and some non-regulated pollutants in 1988. This program, which addresses heightened public awareness of environ-

CHEMRAWN VIII speakers (from left): James Molzon, Allan Ford, Herbert Eleuterio and Kunio Yoshida.

mental issues, has media specific targets with the ultimate goal of zero environmental effect. For example, the company is pursuing a voluntary goal to reduce emissions by 90% by the end of 1992 with an ultimate goal of zero.

Ford described the make-up and operation of the program and discussed company environmental goals and progress in attaining these goals. He provided details of reduction at various plant sites and of specific chemicals as well as environmental expenditures and personnel commitment.

UNIDO's activities

Dr Archalus Tcheknavorian-Asenbauer (United Nations Industrial Development Organization, Vienna, Austria) stated that the deterioration of the environment, to which industry is a major contributor, represents one of the greatest challenges to UNIDO in its attempt to industrialize. Thus, UNIDO has fully committed itself to environmentally sustainable industrial development.

The title of her talk was 'UNIDO's activity in transfer of cleaner chemical technologies'. She pointed out that UNIDO's programmes address environmental aspects of industrialization. In order to maximize the efficiency of raw material usage and to reduce the waste produced through processing, industry must strive, she said, to ensure that industrial output from a given level of resources is maximized. This is the main emphasis of UNIDO's environmental activities, because making industry more efficient not only is good from the environmental point of view but it also makes good business sense.

UNIDO has also developed a programme in sustainable industrial development. The approach of UNIDO to introducing clean technology is a balanced approach where technical, social and economic factors are all balanced against environmental impact. It is because of UNIDO's experience in industry, as well as its strong environmental awareness and capability that it can succeed with this approach.

Dr Tcheknavorian-Asenbauer added that privatization is of particular interest to new and emerging countries, and UNIDO recognizes this. Chemical industries play a particularly key role in any nations's industrial activities. The chemical industry sector can be viewed as the backbone of industrial economies, and it is therefore vital that it be kept operational. Finally, she suggested that, for the reasons of its economic importance and potential to pollute, the chemical industry sector should be given priority in any national programme towards cleaner industrial production. She said UNIDO would look forward to the challenge of assisting further with this.

Archalus Tchneknavorian-Asenbauer spoke about UNIDO activity in transfer of cleaner chemical technologies.

What is cleaner production?

John Kryger (Industry & Environment Programme Activity Centre, United Nations Environment Programme, Paris) asked this question in his lecture on 'Cleaner production: an opportunity for industry'. He answered that cleaner production means the continuous application of an integrated preventative environmental strategy to processes and products to reduce risks to humans and the environment.

For production processes cleaner production includes conserving raw materials and energy, eliminating toxic raw materials, and reducing the quantity and toxicity of all emissions and wastes before they leave a process. For products the strategy focuses on reducing impacts along the entire life cycle of the product, from raw material extraction to the ultimate disposal of the product. Cleaner production requires the application of know-how, improving technology, and changing attitutes.

Kryger believed that one of the main barriers to the adoption of cleaner production by governments and industry is lack of information about it. The UNEP IE/PAC Cleaner Production (CP) Programme aims to help to eliminate that barrier. The programme dates back to activities of IE/PAC in the mid-1970s on low- and non-waste technologies. The programme was not formalized, however, until 1989 in response to directives issued by the UNEP Governing Council meeting that year. The programme was officially launched in 1990 at the Canterbury Seminar in the UK. And, in 1991, directives of the UNEP 16th Session Governing Council effectively institutionalized the programme.

Kryger said that the traditional way of dealing with environmental impacts has been to, in essence, stand at the back end of industrial plants, collect waste by-products, and try to control them in various ways — sometimes by treating them through dilution or detoxification or solidfication — or simply by trying to contain them in barrels or landfills.

Another aspect of this traditional management or control strategy is to view wastes quite narrowly and in separate terms and under different regulatory schemes based on where they end up — in the air, in waterways, or on the land. Thus, some people are concerned about air pollutants, others about waste-water emissions, others about solid wastes.

Cleaner production is quite different. It is applied at the front end of processes and at the idea stage of products. CP is, thus, preventative rather than reactive. In a cleaner production mode, one worries about the totality — the system — rather than focusing on one component, the output.

New generation of technologies

James D. Molzon (AQUATECH Systems, Allied-Signal Inc. New Jersey, USA), reported on 'Using technology alliances to lead sustainable development'. He said that in an era of enormous global pressure for solutions to complex environmental problems, a new generation of technologies is emerging which will reduce serious industrial pollution, and provide the recovery and recycling that transforms wastes into useful, profitable products.

Molzon considered that we need to move quickly to evaluate these systems, communicate their capabilities,

Catalysis helps to create environmentally safe transport and production of motor fuels.

and accelerate their commercial introduction. Accomplishing this in a timely manner will require special strategic alliances comprising customers, technologists, government regulators, public sector investors and specialists in environmental management. Managers of technology must take a leadership role in structuring these strategic alliances.

This strategy has been adopted by AQUATECH Systems, a division of Allied-Signal Inc. It has been actively forming strategic alliances to encourage economical resources recovery, the elimination of air and water pollution, and a reduction in the proliferation of industrial waste landfills.

Systems which employ Allied-Signal's proprietary bipolar membrane technology split salt solutions into acids and bases, and are being used for fluoride recovery and reclamation at oil refineries and stainless-steel manufacturers, the reclamation of sodium sulfate in the pulp and paper industry and for flue gas desulfurization.

Nikolai Platé (Institute of Petrochemical Synthesis of the Russian Academy of Sciences, Moscow) also considered membrane technology in his lecture 'Membranes as a means for solution of environmental problems in chemical production'. He pointed out that membrane technology as an innovative and consistent part of integrated chemical technology and processing has many advantages in solving environmental problems created by the chemical industry.

To illustrate this point, Platé referred to gas separation techniques in the refinery and petrochemical industry, reverse osmosis and electrodialysis in the purification of salted and waste water stocks, ion-exchange membranes used for the extraction of heavy and rare metals in the course of galvanic and other metallurgical and chemical processes.

How catalysis helps

IUPAC Bureau member Kirill Zamaraev (Institute of Catalysis, Novosibirsk, Russia) opened the Tuesday afternoon session with a lecture on 'Catalysis and new technologies for sustainable development'. He said that on the eve of the 21st century new ideas emerging from basic research on catalysis promise breakthroughs that may change the very profile of future industries and make them more efficient, safe and ecologically pure.

Zamaraev summarized the ways catalysis can help as follows:

- Catalysis helps to protect the ozone layer in the development of technologies for production of new refrigerants, blowing and cleaning agents that replace ozone depleting chlorofluorocarbons.
- Catalysis combats the greenhouse effect through the development of:
  1. energy-saving technologies based on environmentally safe catalytic combustion of fuels;
  2. new membrane catalysts for high output fuel cells;
  3. catalysts and processes for solar energy conversion and hydrogen energetics;
  4. catalysts and processes for synthesis from CO_2.
- Catalysis helps to create environmentally safe transport in the production of:
  1. unleaded gasoline;
  2. motor fuels with still lower sulfur content;
  3. automobile catalytic convertors;
  4. a new generation of engines based on the principles of catalytic fuel combustion.

- Catalysis helps to solve environmental problems of energy production by:
  1. catalytic removal of NO_x from flue gases of power plants;
  2. development of environmentally safe catalytic combustion processes;
  3. development of catalytic heat generators (CHGs);
  4. catalytic processing of lignite to produce heat, syngas and semi-coke.
- Catalysis helps to purify industrial exhausts in the development of technologies for:
  1. purification of industrial flue gases from CO, NO_x, SO_2, H_2S, COS, hydrocarbons;
  2. catalytic recycling or incineration of solid and liquid wastes;
  3. replacement of conventional liquid acids by solid superacids in alkylation, etc;
  4. catalytic incineration of pesticides and poisonous organic substances containing Cl, F, P, S, N.
- Catalysis helps to prevent pollution of the atmosphere by H_2S as a result of oil and gas mining by processing H_2S into sulfur in:
  1. the traditional multi-step Claus process;
  2. in a new one-step technology of direct selective oxidation of H_2S to sulfur.
- Catalysis helps to provide highest energy efficiency and minimize consumption of raw materials via such new catalytic technologies as unsteady state reverse processes or CHGs.

Following Zamaraev's lecture, Leo Manzer (Corporate Catalysis Center, Du Pont Company, Wilmington, USA) spoke about 'Environmentally-safer processes; opportunities for catalysis and process research'. He said that increasing awareness over the environmental impact of chemical processes and products is having a profound impact on the petroleum and chemical industries. In addition to remediation, there are tremendous opportunities for catalysis and process research in four main areas:

1. more selective and active catalysts to reduce waste and energy consumption;
2. processes which minimize the use, transportation and storage of hazardous materials;
3. waste minimization through conversion of by-products to co-products;
4. development of environmentally safer products.

Manzer provided examples from recent Du Pont research that illustrated the potential in each of these areas.

Agrochemicals

On Wednesday the conference split into parallel sessions on (1) Basic organic chemicals industry, and (2) Aluminium and other non-ferrous industries. In the former, Mervyn Richardson (Birch Assessment Service for Information on Chemicals, UK) presented a lecture on 'Integrated risk management of agrochemicals from cradle to grave'.

Richardson pointed out that agrochemicals have an unquestionably vital role in increasing crop yields. World-wide, 30% loss in crops result from pests. The chemical industry has provided the farmer with an array of 'arms' to fight this war against pests. However, many of the pesticides developed before the 1980s led to a number of adverse environmental effects, including persistence, bioaccumulation, contamination of water supplies and so on.

The last 2 years has seen a reduction in conflict between major nations. He suggested that the monies hitherto appointed for military purposes has now to be used for environmental protection particularly for emerging nations with their enormous potential for development.

Richardson added that during all stages of the development and the subsequent use of any pesticide, companies will need to ensure that they demonstrate a clear responsibility for the use of such chemicals and their effect on the environmental matrix. This may only be achieved by considering effects with a 'cradle to grave' approach by including all conceivable effects from manufacture, transport, use, persistence in crops, food chain effects and not least disposal. This will increase costs which can be recovered by improved housekeeping, low disposal costs, and reduction in sickness of both employees and of local, national and international communities.

He concluded that implementation of product stewardship and duty of care from 'cradle to grave' is essential if tomorrow's catastrophes are to be averted.

Aluminium and other non-ferrous industries

One of the lectures in this parallel session was presented by Masanori Tokuda (Institute for Advanced Materials Processing, Tohoku University, Sendai, Japan). The title of his lecture was 'Rcycling of rare metals and some impacts on metallurgical processes caused by extensive recycling of aluminium and steel'.

From left: Kirill Zamaraev, John Rees, Bruce Ramsay and Leo Manzer

Tokuda reviewed some typical examples of recycling of rare metals, such as Nb and Ta, in Japan and discussed the role of chemistry in recycling processes. He referred in particular to the production of electronic and magnetic materials. He also discussed the impact of extensive recycling of steel and aluminium on metallurgical processes.

He continued by suggesting that extensive recycling of common metallic materials, steel and aluminium may generate new concepts and novel processes in the metallurgical industries. Finally, he presented the concept of a compost reactor which treats many types of industrial wastes such as slags, sludges, dusts and also toxic wastes such as PCBs. He provided the results of simulations based on thermodynamic models using Zn, S, P and Cl.

Polymer recycling

Wednesday afternoon was devoted to parallel sessions on (1) Production of polymers and recycling of plastics waste, and (2) Pulp and paper industry. The first lecture in the session on polymers and plastics was given by Philip D. Roberts (ICI Chemical and Polymers Ltd, Runcorn, UK). He spoke about 'Environmentally sound technologies and problems in the production of polymers'.

Roberts said that the continuing improvement of production efficiencies has been and will continue to be a driving force within the chemical industry. The rate of improvement will increase because of the demands of society to reduce pollution and waste. These demands have resulted in new legislation in the UK, Integrated Pollution Control, and proposals for new legislation in the European Community. These require the use of Best Available Techniques to minimize environmental effects and the selection of the Best Practicable Environmental Option when discharge of emissions cannot be prevented. He discussed the use of these procedures in the polymer industry.

Later in the afternoon, John Oxley (UNIDO, Vienna) provided a 'Summary and Recommendations of the UNIDO Conference on Ecologically Sustainable Industrial Development (October 1991) in the Area of Plastic Production and Plastic Waste Recycling. The paper states:

Though in-plant recycling of plastic waste is widely practised and often profitable and sometimes even a prerequisite for profitable production and while the recycling of some forms of post-consumer waste such as clean polyethylene terephthalate bottles can be the basis for a very profitable industry, there are considerable technical and economic barriers which confront the recycling of post-consumer plastic waste and, in particular, that occurring in municipal solid waste. Though, for example, in Western Europe, plastics only represent 7% by weight of the total municipal solid waste, they are bulky and voluminous and do not degrade. What is more, the total amount of plastics occurring in Western European municipal solid waste is equal to about 8.5 million tons, which is over 30% of all the plastics consumed here.

Some of the main problems confronting the economic recycling of this waste is the cost of collecting it and sorting it. This cost can be reduced if other potentially valuable products present in municipal solid waste are also collected and sorted as is the case in the city of Shanghai which is receiving assistance from UNIDO with regard to plastic waste recycling. While in some developing countries because of low wages the cost of collecting, cleaning, sorting and recycling plastic waste can be cheaper than in more industrialized countries and, therefore, the potential for profitable recycling higher, this should not lead to uncontrolled, unhygienic scavenging which threatens the existence of many poor people. It is recommended that governments and city authorities encourage the production of utilitarian products such as park benches, acoustic walls and fences which can be made of recycled plastics out of mixed consumer wste industry, avoid making objects using more than one type of plastic for a given article and developing the production of goods which are easily recycled.

In many developing countries, the utilization of plastic resin to make a product with a given end performance is far higher, sometimes as much as 50% higher than is necessary. This in turn leads to an increased production of waste. It was therefore recommended that UNIDO continues its ongoing efforts to provide technical assistance aimed at improving the efficiency of the plastics transformation industries in developing countries so as to improve the performance and life of plastic articles, by introducing improved operating procedures, improving the design of plastic articles, and introducing the use of additives to prolong their lives. This can have an equal if not bigger effect on the reduction of plastic waste than simply recycling it.

Pulp and paper

In the session on pulp and paper industry, Rudolf Patt (Institute of Wood Chemistry, Hamburg, Germany) described 'Environmental management practice and future needs in pulp and paper production in Germany'. He said that over the last two decades pollution abatement was the most important topic of the German pulp and paper industry. Today, the country has strict legislation setting water and air pollution limits for different production lines and charging the remaining pollution by a fee.

He added that as a consequence the pulp and paper industry was forced to develop and apply non-polluting techniques or to shut down mills. The German pulp industry no longer uses chlorine containing bleaching chemicals. But the pulp production is entirely based on sulfite pulping. For high quality pulp production, using all types of lignocellulosic raw materials new pulping processes are being developed which permit chlorine free bleaching and closing of the mills water cycle. All effluents from pulp and paper mills are treated in aerobic and/or anaerobic stages.

Patt stated that the increasing paper consumption of the German population and the poor prospects for waste management is putting pressure on the paper industry to enhance the rate of fibre recycling. This requires improved waste paper preparation techniques, fiber fractionating, upgrading and chlorine free bleaching.

Next, Mikhail Grachev (Limnological Institute, Irkuktsk) lectured on 'Recycling of waste-water and solid waste at the

One of the CHEMRAWN VIII parallel sessions was devoted to the pulp and paper industry.

Selenginsk Pulp and Paper Plant'. He pointed out that the Selenginsk Pulp and Paper Plant is located 60 km from Lake Baikal on the Selenga River. It produces 170 thousand tonnes of unbleached pulp annually. According to the 1987 Decree of the Soviet Government, the plant had to stop waste-water output to the Selenga in 1992.

Grachev then outlined approaches which have been used to help decrease the output of waste-water by 90% in 1989 and to achieve full recyling of water in 1990. Solid wastes have been used for the production of agricultural composts.

Large-scale environmental pollution

The final session, on Thursday morning, focused on 'New approaches to waste treatment and elimination of large scale environmental pollution'. The opening lecture was delivered by Victor Kabanov (Moscow State University, Russia) and was titled 'Environmentally sound polymers for soil consolidation and prevention of wind transfer of ground dust contamintated by radionuclides'.

Kabanov pointed out that interpolyelectrolyte complexes (IPEC) are formed by interaction of two oppositely charged polyelectrolytes dissolved in water or in an aqueous solution of simple salts. Because of a unique hydrophilic/hydrophobic balance, such IPEC materials effectively consolidate a great variety of dispersed systems including sand, soil and so on.

IPEC solutions sprayed onto soil surfaces form an insoluble IPEC-soil crust which swells and protects the ground surface from water and wind erosion. The crust, which contains about 1% IPEC by mass, retains its protective properties under alternating wetting and drying.

Sprouting of various seeds under the crust is promoted due to a certain degree of moisture evaporation and a 'greenhouse' effect. In particular, IPEC crust coating can be used for prevention of wind transfer of the ground dust contaminated by radionuclides.

John Rees (CELTIC Technolgies Ltd, Cardiff, UK) lectured on 'Integrated scientific and engineering methods for the treatment of contaminated ground and groundwater'. He said that the development of effective treatments for contaminated ground throughout the industrialized world depends on a complex range of factors including legislation, political intiatives, social pressures, financial resources and enabling technologies.

As we begin, he said, to move from problem recognition and assessment to the initiation of reliable and durable treatment, it is clear that there are many technologies available and at different stages of development and application. His paper focused on the principles and application of various operational technologies for the treatment of contaminated land, and a consideration of the criteria for selection.

He reviewed the principal initiatives world-wide with regard to development of technolgoies together with a consideration of the underlying research. Rees added that the successful development of technologies is vitally dependent on a far better understanding of the natural fate of pollutants in the environment.

His paper also addressed the concept of risk assessment to determine not only the priority which should be given to the hierarchy of sites selected for treatment, but also the degree of treatment which should be applied. He concluded that this is particularly relevant in situations of limited resources.

After Rees's lecture, Bruce Ramsay (Ecole Polytechnique, Montréal, Canada) spoke about 'Fermentation of waste agricultural material for conversion into biodegradable plastic'. Ramsay considered poly-β-hydroxyalkanoates (PHAs) — a family of biodegradable thermoplastics and elastomers that are accumulated in high concentration by many microbial species.

Ramsay suggested that if PHAs are to be economically competitive they must be produced on a larger scale than any previous aerobic fermentation product and inexpensive raw materials must be used as feedstock. PHA production technology serves as an excellent example of the advantages and disadvantages of using bioprocesses to replace chemical processes.

In his report, Ramsay compared the thermomechanical properties of PHAs with those of other plastics and presented the major cost factors involved in PHA production (substrate, capital and separation costs). He showed that substrate cost reduction is achievable through the use of agricultural and food wastes as substrates. However, when some underutilized materials such as hemicelluloses are used for PHA production, they can actually increase capital and downstream processing requirements.

He continued that cheese whey use can also lead to significant cost reduction but it either must be first converted to an organic acid or alcohol or a recombinant bacterium must be developed for its direct use. Ramsay summed up by saying that the final environmental choice in the use of chemical versus biochemically derived thermoplastics can be reduced to a trade-off betwen increased energy demand (bio) or use of non-renewable resources (chemical).

Methane in the atmosphere

The IUPAC Commission on Atmospheric Chemistry co-sponsored a Workshop on the Assessment of Uncertainties in the Projected Concentrations of Methane in the Atmosphere held in Moscow in July 1992. Sjaak Slanina* and Peter Warneck† report.

Animals, especially domestic ruminants such as sheep, produce methane microbially in their intestines.

Infra-red active gases in the atmosphere keep the Earth's surface temperatures comfortable to life by intercepting and partly storing thermal radiation that otherwise would be lost directly to space. The concentrations of many of these so-called greenhouse gases are currently increasing with the consequence that global temperatures are also rising.

Methane, the most important greenhouse gas next to carbon dioxide in the atmosphere is projected to contribute about 19% to total greenhouse warming compared to 50% for CO_2 (see *Chem. Intl.* **13**, 10). The mixing ratio of methane has been rising at a rate of about 1% per year during the past decade and has now reached 1.7 μmol/mol. Other greenhouse gases whose mixing ratios have been found to increase are the chlorofluorocarbons, ozone and nitrous oxide.

Human activities are largely held responsible for these effects. Model calculations predict a global temperature rise on the order of 3K over the next century, and this has led to an intense debate concerning possibilities of climatic changes.

As a sequel to a very successful workshop dealing with uncertainties of carbon dioxide in the atmosphere (see *Pure Appl. Chem.* **63**, 763–796, 1991), IUPAC sponsored a meeting designed to assess uncertainties in the projected concentrations of methane in the atmosphere. This workshop, which was co-sponsored by the International Institute of Applied Systems Analysis, took place in Moscow in July 1992. The programme was organized jointly by the IUPAC Commission on Atmospheric Chemistry (VI.4) of the Applied Chemistry Division, the Netherlands Energy Research Foundation, and the Institute of Chemical Kinetics and Combustion of the Russian Academy of Science, Siberian Branch..

The workshop was to review the current knowledge of sources and atmospheric behaviour of methane in order to identify major areas of uncertainty. Leading experts, invited to report on recent developments, included Dr M.A.K. Khalil, E. Matthews and M. Wahlen. In addition, members of the Commission on Atmospheric Chemistry were asked to review specific subjects and, in particular, the situation in Russia and the Asian countries.

The important role of methane in climatic forcing was highlighted. It was pointed out that the emissions of methane could rise very considerably in the future, due to increasing agricultural and industrial production and population growth. But many uncertainties exist in our present estimates of temperature changes, due to the enhanced greenhouse effect. It can be argued that most of the climatic forcing by greenhouse gases was compensated by cooling due to increased concentrations of aerosols in the atmosphere.

Measurements of methane in Greenland and Antarctic ice cores indicate pre-industrial CH_4 mixing ratios in the atmosphere of about 0.65 μmol/mol. Wetlands must have been the dominant source of methane under these conditions with an estimated global source strength of 180–380 Tg/a (180–380 ∞ 10^{12} grams/year). The current total source strength is estimated to be about 500 Tg/a. The table gives a breakdown into individual processes that contribute to the global budget.

The data make evident that about 70% of methane arises from human activities. Methane is produced naturally by

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microbial breakdown of organic material under anaerobic conditions. Whereas methanogenic bacteria are strict anaerobes, a host of other bacteria feed on methane once it reaches aerated strata in waterlogged soils, thereby reducing the flux of methane escaping to the atmosphere. Thus, shallow ponds, alluvial wetlands, rice-paddy fields, etc., are the most important source areas. In addition methane is microbially produced in the intestines of and exhaled by cattle, sheep and other domestic animals. The table shows that more than 60% of human related sources are associated with agricultural practices, only 25% stem from coal mining and other fossil-fuel-related activities.

There can be no doubt that the recent growth in the concentration of methane in the atmosphere is due to an expansion of agricultural activities that were needed to feed a growing human population. Indications exist that no longer a one-to-one correlation can be observed between increase of methane concentration in the atmosphere and population growth. This correlation has been observed during a period of several decades.

In the atmosphere, methane is attacked by OH radicals and is then oxidized toward CO and CO_2. Hydroxyl radicals, OH, are generated in a reaction of excited oxygen atoms with water vapour, the oxygen atoms being formed by photolysis of ozone in ultraviolet sunlight. Although these processes are well understood, the direct measurement of OH concentrations is difficult, and the OH concentration field has to be calculated. Although most of the input data are reasonably well known, it was surprising to learn how much uncertainty still exists in this respect.

Table. Sources of methane in the atmosphere and global strength estimates (Tg/a)

Fossil fuel	35
Coal mining	40
Natural gas	
• venting	10
• transmission losses	30
Biomass burning	35
Natural wetlands	115
High latitude (bogs, tundra)	35
Low latitude (swamps, aluvial)	80
Rice cultivation	100
Animals (mainly domestic ruminants)	80
Termites	20
Oceans	10
Landfills	25

An overview of the present estimates of methane emissions (see Table) was presented. It was emphasized that the uncertainties in a number of sources is very large, even to the point that the uncertainties at present are about in the same magnitude as they were 5 years ago.

Biomass burning is an important source of methane emissions, but it is very difficult to extrapolate the few data which are available, to global estimates of the strength of this source.

Methods available for estimating the strengths of sources generally combine emission factors determined by field measurements with statistical data on the extent of source areas, animal populations, etc. The errors involved in deriving such estimates can be appreciable. Therefore one has looked into other data that might conceivably provide further constraints to the methane budget, especially carbon isotope ratios. For example, fossil methane would be depleted in radiocarbon compared with methane of recent biological origin, since the source of ^{14}C is the interaction of cosmic radiation with atmospheric nitrogen, and ^{14}C has a half life of 5700 years. A wide variety of data on carbon and hydrogen isotopes in methane from various sources and in the atmosphere is now available. Unfortunately, this additional information still leaves the relative contributions of many biogenic sources undefined.

It is of great importance that the main rice-growing countries have been alerted to the problem of methane increase in the atmosphere, and more-detailed information on the contribution of rice cultivation to atmospheric methane is now being sought on the basis of an improved knowledge of local conditions. An unexpected conclusion of the workshop was that India, one of the main rice growing countries, contributes no more than 7% off global emissions from rice crops, because most Indian paddy crop is taken from irrigated field and only a small portion from water-logged fields.

The latest reports about the emissions of Northern Wetlands, indicate that these emissions are substantially lower as formerly assumed. The emissions of Northern wetlands are probably in the order of 20 Tg/a instead of 80.

The losses of natural gas in Russia, during exploration and transport, are certainly not as large as assumed in some West-European studies (up to 25%). So leakage of natural gas in Siberia cannot fill, according Russian data, the gap in emission strength, caused by the much lower emissions of wetlands and ricepaddies.

On the other hand, the emissions of landfills could be much larger than previously assumed, based on the first results of measurements in China.

Japan has started environmental programs for abatement of methane emissions. The emissions in Japan are not as high as expected, based on former estimates, again because of lower emissions of ricepaddies.

It is clear that large uncertainties exist regarding the emissions of methane and that the uncertainty in atmospheric oxidation is so large (in the order of 40% according the estimates of Dr Calvert) that this mechanism cannot be used to check our emission inventories.

Measurement of isotope ratios ($^{14}C/^{12}C$ and $^{13}C/^{12}C$) can also provide data to validate emissions, but at present this technique is insufficiently precise to check detailed emission inventories.

Specific validation measurements, to evaluate emissions on regional and (sub)continental scale are required to check whether the extrapolation of measurements of methane emissions, carried out on very small scale, to global dimensions has been carried out correctly in the past.

Macrocyclic ligands

The 1992 IUPAC-sponsored International Symposium on Macrocyclic Ligands for the Design of New Materials focused on synthetic and structural aspects, thermodynamics and kinetics, and applications. There were also discussions on the role of chemistry in industrial development in Latin America and its research activities and academic links.

The IUPAC-sponsored International Symposium on Macrocyclic Ligands for the Design of New Materials organized by the European Latin American Research Group took place at the University of Surrey, Guildford, UK, from 14th to 16th September 1992. Just over 100 scientists from 32 countries attended the meeting which included 10 plenary lectures, 8 invited lectures and 16 short oral contributions.

The research group and the symposium organizing committee were chaired by Dr Angela F. Danil de Namor who is a member of the IUPAC Commission on Solubility Data (V.8) and was recently nominated Chairman of the Commission's Working Party on Macrocyclic (Supramolecular) Chemistry.

Speakers at the opening ceremony on the Monday morning were Dr Danil de Namor, Prof. P. H. W. Butterworth (Senior Academic Vice Chancellor, University of Surrey), Prof. J. W. Lorimer (Past-Chairman of Commission V.8 and Official Representative of IUPAC) and Dr C. Kessler (European Community).

Synthetic aspects

The first session of plenary and invited lectures was devoted to synthetic aspects. The initial plenary lecture on 'Design of anion receptors — applications' was presented by Bernard Dietrich (Laboratoire de Chimie Supramoléculaire, Université Louis Pasteur, Strasbourg, France).

He pointed out that the fundamental concepts introduced some 25 years ago for the recognition of cationic substrates have been more recently applied to anionic species. However, over the past decade the field of anion coordination chemistry has been studied very actively.

Jack Lorimer addresses participants at the opening ceremony.

With respect to cationic complexation, anionic recognition rests on the design of the receptor, that is the shape of its cavity and the binding sites which line this activity. The cavity size has to be adjusted to the size of the anion in order to achieve a good substrate/receptor complementarity. The binding sites for anions can be either charged (guanidinium, ammonium, etc.) or neutral (Lewis acid functions like Sn, Hg, B, Si).

Dietrich said that macrocyclic, macrobicyclic, and macrotricyclic polyammonium, and polyguanidinium receptors have been synthesized and shown to form complexes with a large variety of anions. Macrocyclic and macrobicyclic molecules containing Lewis acids have been developed quite recently although their complexation has been limited until now to small anions.

He reported that anion complexation has been investigated in solution mainly by NMR spectroscopy and pH-metric studies. Many solid structures have been established by X-ray crystallography.

In conclusion, Dietrich said that anion complexation has already found or may find applications in various areas: anion transport, anion selective electrodes, photochemistry, electrochemistry, catalysis and others.

Later in the same session, Arl Koskinen (University of Oulu, Finland) spoke about 'Asymmetric synthesis of chiral macrocyclic ligands'. He reminded participants that chirality is a fundamental property of biological molecules and the recognition phenomena associated with these compounds.

He continued that in order to better understand the energetics and dynamics of such recognition processes at atomic resolution, one needs to be able to separate the electrostatic and dipolar interactions from the stereoelectronic contributions. This can be achieved by either studying the naturally occurring chiral entities participating in recognition, or by careful design of mimics of natural products. The latter approach allows the possibility of separating the different contributions. He stressed that great care must be exercized in designing such probes.

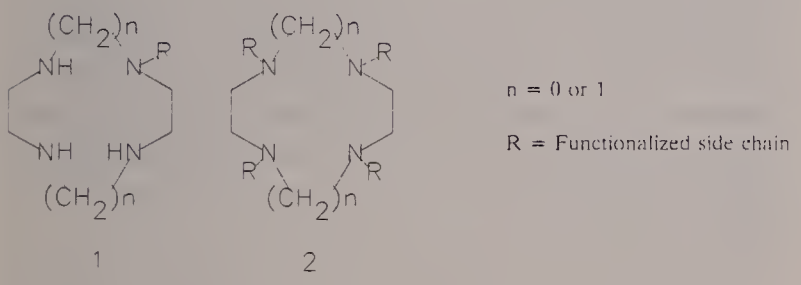
In his lecture, Koskinen discussed some of the different strategies adopted for the design and synthesis of chiral ligands for the study of complexation phenomena. He presented various approaches allowing the synthesis of chiral ligands (hosts) with stereocontrol. He also described the design of highly functionalized ligands capable of multi-point recognition and the adopted synthetic route.

University of Surrey.

Structural aspects

Thomas A. Kaden (Institute of Inorganic Chemistry, University of Basel, Switzerland) opened the second session of the meeting with a plenary lecture on 'Structural aspects of metal complexes with functionalized tetraazamacrocyclic ligands'.

He reported that functionalized tetraazamacrocycles with pendant donor groups are a new class of ligands which form metal complexes with interesting structure properties. To illustrate the variety and peculiarity of such systems he used metal complexes of macrocycles with one (1) and four (2) pendant groups.



1 2

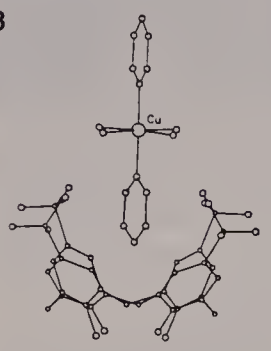
For ligands of type 1 he showed that the effect of the coordination of a side chain can be manyfold. There are examples in which neither the coordination geometry around the metal ion, nor the configuration of the macrocycle are altered. There are cases in which the coordination number of the metal ion is increased, since an additional metal to ligand bond is formed with the side chain donor group thus giving a new coordination geometry. Finally there is one example in which a drastic rearrangement of the whole metal macrocyclic unit occurs, to give a geometrical and a configurational change.

For ligands of type 2 the structural aspects strongly depend on the ring size of the macrocycle, on the nature of the side chain, and on the coordination number of the metal ion. Kaden described examples of 1:1 complexes with the metal ion inside or outside the macrocyclic ring and of 2:1 species that have been characterized.

Following Kaden's lecture, Jerry L. Atwood (University of Alabama, USA) presented a plenary lecture on 'Supramolecular assemblies based on calixarenes'. He said that the calix[4]arenes in the cone conformation possess an easily functionalized upper rim which bounds a hydrophobic pocket of molecular dimensions. For the water-soluble derivatives most of the published work concerns the sulfonates. For these species a variety of neutral, cationic, and anionic guests are known to bind to the cavity by means of non-covalent interactions.

Of special interest, he suggested, are the complexes in which the calixarene serves as a second-sphere ligand for transition metal ions (3). He added that second-sphere coordination may be considered as an organizational principle in supramolecular chemistry.

3



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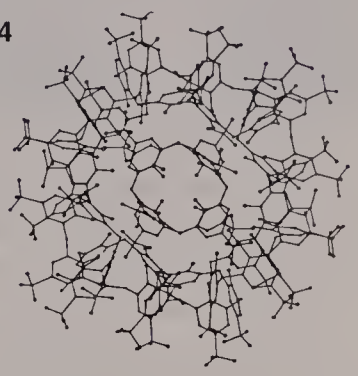


Atwood continued by saying that in the development of large assemblies, coordination beyond second-sphere will be necessary. He revealed the first example of third-sphere coordination of a calixarene to a transition metal. The largest assembly thus far characterized by X-ray diffraction techniques involves 12 calixarenes, as in (4).

Thermodynamics and kinetics

The third session of the symposium was held on Tuesday afternoon and devoted to thermodynamics and kinetics. IUPAC affiliate Reed Izatt (Brigham Young University, USA) opened the session with a plenary lecture on 'Thermodynamics of cation-macrocycle interaction'.

He pointed out that rapid progress in designing and synthesizing new macrocycle hosts and studying their interactions with cationic, anionic, and neutral guests has been due in no small part to the availability of reliable and extensive thermodynamic data for a large number of host–guest systems. As the complexity of these host–guest systems becomes greater, and as new solvent systems are investigated, the difficulty of determining reliable data increases.

Izatt stated that few calorimetric data have been reported for host–guest systems, although valuable information concerning these systems can be derived from ΔH, ΔS, and ΔC_p values. He discussed the procedures required to obtain reliable thermodynamic data. He gave some of the kinds of information which these data can provide together with examples. Finally, Izatt presented examples of recent studies that have demonstrated the power of combined thermodynamic and spectroscopic data in understanding host–guest interactions.

Later that afternoon, Commission V.8 Chairman Mark Salomon (US Army ETDL (LABCOM), Fort Monmouth, USA) lectured on 'Mobilities of action-macrocyclic ligand complexes'. He reported the determination of formation constants for complexation between alkali metal cations and the crown ether 18C6 in the solvent 2-cyanopyridine at 30 °C from conductance measurements.

Salomon said that the method allows for precise determination of these formation constants up to values of K_f around

Lecturers (from left): Mark Salomon, Arl Koskinen and Reed Izatt.

Below: informal discussions during a coffee break.

10^{11} mol^{-1} dm^3. The method permits accurate evaluation of association equilibrium constants between the complex species $(M–18C6)^+$ and the anion. The magnitudes of these ion association constants are related to the nature of the solvation of the cation and of the complexed cation.

The mobiities of the complexes are also dependent, in part, upon solvation effects, reported Salomon. In 2-cyanopyridine the single ion molar conductance of the $(Li\text{-}18C6)^+$ complex is greater than that of the uncomplexed cation. Similar behaviour is observed for alkali metal complexes with 18C6 and the cryptand 222 in other solvents such as propylene carbonate and propylene carbonate mixtures with dichloromethane.

Applications

Session 4, held on the final day of the symposium, was concerned with applications of macrocyclic ligands. The session included a lecture by Past-Chairman of Commission V.8, Jack Lorimer (The University of Western Ontario, London, Canada) on 'Solid polymer electrolytes and macrocyclic ligand-ion interactions'.

Lorimer summarized the present state of knowledge of the structure and phase behaviour of solid polymer electrolytes containing ether linkages, as well as their most important property from a practical point of view: the conductivity as a function of salt content and temperature.

He briefly described theories of conductivity along with the effects of modifications in structure and direct incorporation of macrocyclic ligands into the electrolytes. He illustrated the similarities between macrocyclic ligand–ion interactions and polymer electrolyte–ion interactions by comparison of ion interactions with crown ethers, glymes and MEEP [poly(bismethoxyethoxyethoxide)phosphazene]. Finally Lorimer discussed a few of the many unsolved problems presented by polymer electrolytes, despite intensive study over almost two decades.

Latin America

Chemistry in Latin America was a continuing theme throughout the symposium. For example, during the opening ceremony it was announced that Dr Angela Danil de Namor had been appointed Honorary Professor at the National University of San Agustin, Arequipa, Peru in recognition of her contributions to the development of chemistry in the southern region of Peru. Readers of this magazine may recall that Danil de Namor has already described 'Contributions to the development of chemistry in South America: The link between the Universities of Surrey (UK) and San Agustin (Peru)' (see *Chem. Intl.*, **13**, 219, (1991)).

On the first day of the symposium there were brief presentations and discussions on research activities in Latin America. Delegates from Argentina, the Dominican Republic, Peru and Uruguay contributed. After the second session of the meeting a round table on 'The role of chemistry in the industrial development of Latin America' was held .

An example of cooperation between Surrey and Latin America was provided in Session 3 with a lecture on 'p-*tert* Butyl calix(*n*)arene–amine interactions: Thermodynamic and electrostudies'. The paper was co-authored by A. F. Danil de Namor, M.T. Garrido Pardo (who presented the lecture), D. A. Pacheco Tanaka, F. J. Sueros Velarde (all from the University of Surrey) and C. Cabaleiro (Universidad Nacional del Sur, Argentina).

In the session on applications of macrocyclic ligands, Prof. F. H. Marquardt (University of Santiago, Chile) spoke briefly about 'Research activity in Chile on the integral use of krill as industrial raw material: preparation of colorless chitin'.

In the abstract of his paper, Marquart writes that Antarctic krill (*E. superba*) is a planktonio shrimp, which exists with a biomass of about 270 milion tonnes and is presently exploited for its tail meat. The residues of this process consist of the exoskeleton, which is mineralized chitin, and a major part of the tail meat which remains attached to the exoskeleton. The residual tail meat can be recovered as a protein paste. Because this paste contains up to *c.* 2-mg/g fluorides, it is considered unfit for human consumption. The processing residue is therefore dumped. Marquart briefly described methods to reduce the fluorine content to about 0.6 mg/g and exploit these residues.

Report by CI Editor Mike Freemantle

PAC review

Pure and Applied Chemistry (*PAC*) is IUPAC's official journal. It publishes the main invited lectures of symposia sponsored by the Union; the recommendations of its Commissions on nomenclature, symbols and units, and technical reports on standardization, recommended procedures, collaborative studies and dara compilations. Summaries of the most recent IUPAC recommendations on nomenclature and symbols, and technical reports appearing in *PAC* are published in *Chem. Intl.* in the section Recent Reports. In this section we take a brief look at the symposia and lectures published in recent issues of *PAC*.

Nitrogen fixation

Professor A. E. Shilov (Institute of Chemical Physics, Chernogolovka, Russia) presented a plenary lecture on 'Intermediate complexes in chemical and biological nitrogen fixation' at the 29th International Conference on Coordination Chemistry held in Lausanne, Switzerland, July 1992.

Shilov discussed the mechanism of dinitrogen reduction in protic media in the light of results obtained for specially prepared binuclear complexes MNNM with bridging dinitrogen capable of being protonated and reduced. He concluded that complexes in which M has a d^2 or d^3 electronic configuration together with an additional electron donor are likely intermediates in catalytic dinitrogen reduction by comparatively weak reducing agents. He compared model systems with the active centre of the dinitrogen fixing enzyme, nitrogenase.

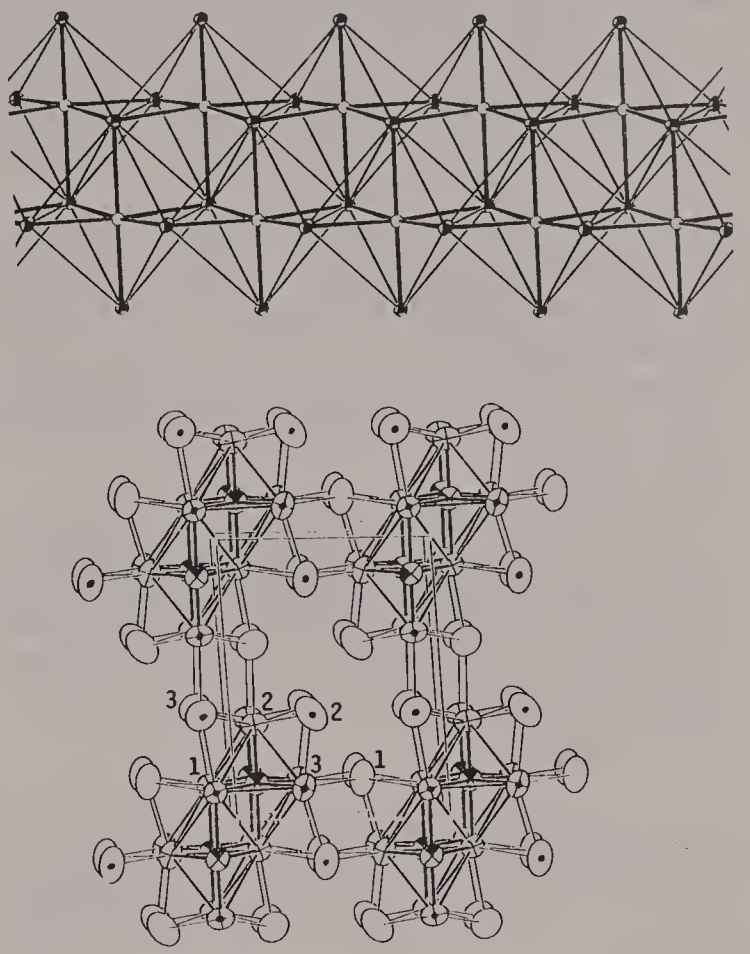
Shilov's lecture and the following three plenary lectures were published in the October 1992 issue of *Pure Appl. Chem.*:

- The delta bond — an old story with a new twist (F. A. Cotton, USA);
- Coordination chemistry in the solid state: Cluster and condensed cluster halides of the early transition metals (J. D. Corbett, USA);
- Multiple weak forces in ion-binding molecules (A. Shanzer, J. Libman and S. Lifson, Israel)

Cluster and condensed cluster halides

Corbett pointed out, in his lecture, that the 'inner sphere' halides in M_6X_{12} (edge-bridged) or M'_6X_8 (face-capped) clusters are always augmented by six 'outer sphere' halide (or other) ligands at the metal vertices. The inclusion of one of *c.* 24 interstitials within M_6X_{12} clusters of group 3 and 4 transition metals generates a large family of cluster compounds that are stable in high-temperature solid-state systems.

Corbett reported that the electronic versatility provided by the centred interstitials greatly expands the variety of compositions, structures, and intercluster halogen-bridging modes. He added that the condensation of metal clusters into a variety of infinite chain products, most of which are also centered, is also encountered. One of the examples Corbett used to illustrate his talk is shown in the Figure.



Pr_3I_3Ru: The double chains of condensed, Ru-centered clusters with iodine omitted (above) and a projection along the chains with iodine added (below). Dotted atoms differ by half the chain repeat from those without.

Budapest Congress

The October 1992 issue of *Pure Appl. Chem.* also contains eight of the invited lectures presented at the Inorganic and Physical Chemistry Section of the 33rd IUPAC Congress held in Budapest, Hungary, on 17–22 August 1992.

They include a lecture on 'Pressure as a mechanistic indicator in substitution reactions of metal complexes' by IUPAC affiliate Rudi van Eldik (Institute for Inorganic Chemistry, University of Witten/Herdecke, FRG). In the abstract of the paper, Eldik writes that substitution reactions of transition metal complexes are of fundamental importance to the understanding of many chemical and biological processes since they usually occur at the crucial point where the metal centre exhibits its catalytic activity.

He adds that the ability of metal complexes to bind additional ligands or to exchange their ligands according to well defined routes has stimulated many systematic studies of the mechanisms of such processes. In the past, such studies usually involved the application of conventional kinetic techniques which included systematic measurements of the concentration, ionic strength, solvent, pH and temperature dependence of such processes.

Over the past decade, instrumentation has been developed that now enables kineticists to study the pressure dependence of such processes by adding an additional physical parameter to the kinetic variables. The paper by van Eldik shows that ligand substitution reactions exhibit very characteristic pressure dependences such that pressure has become a reliable mechanistic indicator for such processes.

The other Budapest papers published in this issue of *Pure Appl. Chem.* are:

- The chemical and photochemical reactions of metal carbonyl cluster compounds on solid surfaces (H. Kuroda, Japan);
- Kinetics of charge transfer processes in photochemical lasers (I. D. Mikheev, Russia);
- The kinetics and thermodynamics of free radical reactions (M. J. Pilling, UK);
- Molecular electronic energy transfer in bichromophoric molecules in solution and in a supersonic jet expansion (S. Speiser, Israel);
- Space concept in chemistry (I. Hargittai, Hungary);
- Liquid adsorption and immersional wetting on hydrophilic/hydrophobic solid surfaces (I. Dékány, Hungary)
- Homogeneous catalytic oxidation of *o*-substituted anilines with dioxygen in the presence of cobalt and manganese complexes (L. I. Simándi, T. Barna, Z. Szeverényi and S. Németh, Hungary).

Surface and colloid science

The 7th International Conference on Surface and Colloid Science took place in Compiègne, France, on 7–13 July 1991.

The conference mainly consisted of keynote lectures grouped into the following topical symposia: Surfactancy and supramolecular self-assemblies; Characterization and modification of surfaces; Wetting and adhesion; Chemical processes on solid surfaces; Nucleation phenomena; Aerosols; Preparation and characterization of colloid particles; Emulsions and suspensions; Biosurfactants; Food colloids; Biological macromolecules; and Interactions between living systems and biomaterials

These keynote lectures and the following two plenary lectures were published in the November 1992 issue of *Pure Appl. Chem.*:

1. Long-ranged surface forces: The structure and dynamics of polymers at interfaces (J. Klein, Weizmann Institute of Science, Rehovot, Israel).
2. Special features of water-soluble polymers (P. G. De Gennes, Collège de France, Paris).

Bioactive specific biomaterials

Several IUPAC affiliates contributed to the scientific programme. For example, Jacqueline Jozefonvicz and Marcel Jozefowicz (Laboratoire de Recherches sur les Macromolécules, Villetaneuse, France) co-authored a paper on 'Bioactive specific biomaterials: Present and future'.

They reported the design of bioactive biomaterials made of synthetic or artificial polymers substituted with specific chemical functional groups carried by the macromolecular chain to develop specific interactions with living systems. These soluble or insoluble polymers are derived from polystyrene and dextran.

According to Jozefonvicz and Jozefowicz, such functional polymers may be endowed with anticoagulant heparin-like properties and, as a consequence, possess low thrombogenicity when they are in contact with flowing blood. Other functional polymers have been tailored specifically to interact with components of the immune system. Some polymers, in contact with cells can affect both cell growth and cell biological functions or only cell biological activity without necessarily undergoing change in all characteristics.

Using the above concepts, the two authors demonstrated that a random statistical distribution of chemical groups along the macromolecular backbone correlates with the biological properties of these polymers.

George Nancollas.

Calcium phosphate involvement in biological processes

IUPAC affiliate and former Analytical Chemistry Division President George H. Nancollas (State University of New York at Buffalo, USA) presented a keynote lecture on 'The involvement of calcium phosphates in biological mineralization and demineralization processes'.

According to the abstract of his paper, the formation, remineralization and dissolution of hard tissues are complex processes that involve numerous calcium phosphate phases. Many biological mineralization processes, may therefore involve the formation of metastable intermediates which may subsequently transform into thermodynamically more stable phases.

In the paper, Nancollas discusses physical chemical constant composition methods that enable kinetics studies to be made of the simultaneous growth and/or dissolution of multiple calcium phosphate phases. These methods have been used to investigate the participation of precursor phases such as dicalcium phosphate dihydrate and octacalcium phosphate in the formation of the thermodynamically more stable hydroxyapatite.

Ions other than those of the crystal lattices as well as other molecules in the solution, while not significantly incorporated into the precipitated crystallite phases, may markedly influence the rates of mineralization and demineralization. This is especially true in supersaturated biological fluids such as serum and saliva in which many macromolecules, while behaving as precipitation inhibitors when present in the solution phases, may actually nucleate calcium phosphate phases when immobilized on surfaces.

Surface-analytical techniques

A paper by M. J. Graham (National Research Council of Canada, Ottawa) on 'Recent advances in oxide film characterization' considered the application of surface-analytical techniques to characterize both thin (about 2 nm) passive oxide films and thick (up to 1 μm) oxides formed on metals and alloys at high temperature. The paper includes a summary of surface-analytical techniques (*see* Table).

Graham placed emphasis on the use of SIMS and EEL microscopy to provide chemical information at high spatial resolution. He stated that characterization of oxide films on an atomic scale leads to a better understanding of the processes which take place during corrosion and oxidation.

Technique	Measured Particle	Process	Information	Probing Depth	Spatial Resolution
X-ray Photoelectron Spectroscopy (XPS or ESCA)	Photoelectrons excited by soft X-rays	X-ray e	• Elemental analysis • Chemical bonding • Depth profiles	1-3 nm	> 50μm
Auger Electron Spectroscopy (AES)	Auger electrons normally excited by incident electron beam	e e	• Elemental analysis • Depth profiles	1-3 nm	> 50nm
Secondary Ion Mass Spectrometry (SIMS)	Ions ejected from surface by primary ions	Ion Ion	• Elemental trace analysis • Depth profiles	<1 nm	> 10nm
Fe^{57} Conversion Electron Mössbauer Spectroscopy (CEMS)	Conversion and Auger electrons produced at resonance by 14.4 KeV γ-rays	γ-ray e	• Fe-containing phase identification	1 nm-0.5 μm	> 1mm

Table. Summary of surface-analytical techniques.

Provisional Recommendations

IUPAC seeks your comments

In this section we publish synopses of IUPAC's latest provisional recommendations on nomennclature and symbols. All comments on these recommendations are welcome and will be taken into consideration. The final revised versions are published in *Pure and Applied Chemistry* and synopses of these are published in *Chem. Intl.* as recent reports.

If you would like to comment on the provisional recommendations please write to your nearest national/regional centre requesting a copy of the full report. Copies are not available from the IUPAC Secretariat. The most up-to-date list of the national/regional centres appeared in *Chem. Intl.* **14**, 25 (1992).

Impedances of electrochemical systems: Terminology, nomenclature and representation. Part 1: Cells with metal electrodes and liquid solutions

This document provides an inventory of the parameters that are in use to describe impedances of electrochemical cells. The definitions of these parameters are given, as well as recommendations for their terminology and nomenclature. Where relevant, experimental determination of a parameter and limitations to its validity are briefly discussed.

Comments on the document are welcome and should be sent by 31 July 1993 to: Dr M. Sluyters-Rehbach, Department of Electrochemistry, Debye Institute, University of Utrecht, The Netherlands.

Structure-based nomenclature for irregular single-strand organic polymers (Provisional Recommendations 1991)

There is no accepted practice for the naming of many types of irregular polymers. This document describes a structure-based nomenclature system for irregular single-strand organic polymers, i.e. single-strand organic polymers that can be described by the repetition of more than one type of constitutional unit or that comprise constitutional units not all connected identically with respect to directional sense. The new system names irregular polymers for which the source-based system is inadequate, e.g. polymers that have undergone partial chemical modification, homopolymers having both head-to-tail and head-to-head arrangements of monomeric units, and polymers derived from a single monomer that can provide more than one kind of monomeric unit. In addition, it provides a structure-based alternative to source-based nomenclatures for copolymers. Irregular polymers, oligomers, or blocks are named by placing the prefix 'poly' before the structure-based names of the constitutional units; the latter are collectively enclosed in parentheses, with the names of the component constitutional units separated by oblique strokes. Block copolymers are named by using dashes for the bonding of blocks with each other and with junction units. With graft and star polymers, the grafts or the arms, respectively, are considered to be substituents to the main chain, and the structure is named in the same way as a regular or irregular polymer.

Comments on the document are welcome and should be sent by 31 July 1993 to: Prof. K. Hatada, Department of Chemistry, Faculty of Engineering Science, Osaka University, Toyonaka, Osaka, 560 Japan.

Recent Reports

In this section we publish summaries of the most recent IUPAC recommendations on nomenclature and symbols and technical reports. The full texts of these recommendations and reports are published in *PAC*.

Atomic weights of the elements 1991

The biennial review of atomic weight, A_r(E), determinations and other cognate data has resulted in changes for the standard atomic weight of indium from 114.82±0.01 to 114.818±0.1 and for osmium from 190.2±0.1 to 190.23±0.03 due to new high precision measurements. Recent investigations on silicon and antimony confirmed the presently accepted A_r values. The footnote 'g' was added for carbon and potassium because it has come to the notice of the Commission that isotope abundance variations have been found in geological specimens in which these elements have an isotopic composition outside the limits for normal material. The value of 272 is recommended for the $^{14}N/^{15}N$ ratio of N_2 in air for the calculation of atom percent ^{15}N from measured $\delta^{15}N$ values. Because many elements have a different isotopic composition in non-terrestrial materials, recent data on non-terrestrial material are included in this report for the information of the interested scientific community.

This report was prepared for publication by the Commission on Atomic Weights and Isotopic Abundances, Inorganic Chemistry Division, and published in Pure Appl. Chem. ***64****, 1519–1534 (1992).*

'Atomic weight': The name, its history, definition, and units

The widely used term 'atomic weight' and its acceptance within the international system for measurements has been the subject of debate. This paper summarizes the history of positions taken and the reasons given by IUPAC's committees, commissions, and publications.

This report was prepared for publication by P. De Bièvre and H. S. Peiser, Commission on Atomic Weights and Isotopic Abundances, Inorganic Chemistry Division, and published in Pure Appl. Chem. ***64****, 1535–1543 (1992).*

Conversion of temperatures and thermodynamic properties to the basis of the International Temperature Scale of 1990 (Technical Report)

Tables of temperature differences between the International Temperature Scale of 1990 (ITS-90) and earlier temperature scales (IPTS-68, EPT-76, IPTS-48, and ITS-27) are presented. These tables also contain values of the derivatives of these differences with respect to temperature. Analytical equations to reproduce the temperature difference ($T_{90} - T_{68}$) and its first derivative are also given. This information is needed for the adjustment of thermodynamic results to the basis of the ITS-90. Thus, for the most accurate thermodynamic results, it is preferable to change the temperatures of the original work to the ITS-90 and then recalculate the thermodynamic results on this basis. However, conversion formulae based upon a Taylor expansion of the enthalpy have been derived previously by Douglas (*J. Res. Natl. Bur. Stand.* **A73**, 451–470 (1969)). These equations are greatly simplified when the differences between the two temperature scales are small. Approximate effects resulting from the conversion from the IPTS-68 to the ITS-90 and from the IPTS-48 to the ITS-90 for existing calorimetric determinations of heat capacity, enthalpy, and entropy have been calculated with the equations of Douglas for ND_4ReO_4(s), $BaSnF_4$(s), α-Al_2O_3(s), $BeO{\cdot}Al_2O_3$(s), $BeO{\cdot}3Al_2O_3$(s), and Mo(s). The results of these calculations are given in tables which can be used to assess conveniently the approximate effects on thermodynamic properties due to the differences in these temperature scales. It is found that only the most accurate thermodynamic results require examination and possible adjustment because of a change in the temperature scale.

This report was prepared for publication by Robert N. Goldberg and Ron D. Weir, Commission on Thermodynamics, Physical Chemistry Division, and published in Pure Appl. Chem. ***64****, 1545–1562 (1992).*

Consistent values of rate parameters in free radical polymerization systems (Technical Report)

To overcome the wide divergence in literature values of kinetic parameters for free radical polymerizations under ostensibly the same conditions, agreed values are given of some fundamental kinetic parameters for simple monomers: propagation rate coefficients and initiator efficiencies for styrene and MMA obtained independently using quite different methods and assumptions. These results and the methodologies employed provide useful 'benchmark' tests for other workers and for new techniques. Literature discrepancies are ascribed to subtle mechanistic assumptions made in data interpretation, which are considered in detail. A series of recommendations to assist in overcoming these problems, and to highlight their origins, are presented, with emphasis placed on new techniques including those employing laser photolysis and EPR.

This report was prepared for publication by Robert G. Gilbert, Working Party on Modelling of Polymerization Kinetics and Processes: Micro Subgroup, Commission on Polymer Characterization and Properties, Macromolecular Division, and published in Pure Appl. Chem. ***64****, 1563–1567 (1992).*

Publications

Olefin and vinyl polyermization and functionalization

The International Symposium on Olefin and Vinyl Polymerization and Functionalization — Reaction, Mechanism and Industrial Application (IUPAC Polymerization 1991) was held on 14–18 October 1991 at Hangzhou, China. The symposium was co-organized by Zhejiang University, Hangzhou, and Peking University, Beijing, and co-sponsored by the National Natural Science Foundation of China, the Polymer Division of the Chinese Chemical Society, Beijing, and IUPAC.

The scientific programme was divided into three sessions and a panel discussion of seven panelists:

1. Free-radical and photo-induced polymerization.
2. Ziegler-Natta and related polymerization.
3. Polymer functionalization and chemical modification.
4. Panel discussion on 'Importance of polymer synthesis in the future polymer world'.

There was a total of 111 orally contributed papers. These included 18 invited lectures and the following three plenary lectures:

- The role of amine in vinyl radication polymerization (X. D. Feng, (Peking University, Beijing, China).
- Advances in Ziegler-Natta polymerization — unique polyolefin copolymers, alloys and blends made directly in the reactor (Paolo Gilli, Montecatini Tecnologie, Milan, Italy, and J. C. Haylock, HIMONT Inc., Ferrara, Italy).
- Surface modification of polymers by photoinitiated graft polymerization (Bengt Ranby, The Royal Institute of Technology, Stockholm, Sweden).

These three lectures and the 18 invited lectures were published as Volume 63 (October 1992) of the series *Die Makromoleculare Chemie, Macromolecular Symposia*. The Symposium Editor and Chairman of IUPAC Polymerization 1991 was Xin-De Feng (Peking University, Beijing, China).

Marine pollution

The most recent issue of *Industry and Environment* (Vol. 15, Nos 1–2, January–June 1992) is a double issue largely devoted to marine pollution. Article topics include:

- Marine pollution from land-based sources: facts and figures.
- Coastal development and environmental protection in China.
- La pollution industrielle d'origine tellurique des zones côtières en Méditerranée française.
- Industrie et environnement en Méditerranée.
- Wastewater management in Kastela Bay, Croatia.
- Land-based sources of coastal and marine pollution in CARICOM (Caribbean Community) countries.
- Disposal of fish wastes in Atlantic Canada.
- Treatment of fish processing wastes in Japan.
- Reception and treatment facilities for waste oils and oil-polluted waters from marine and industrial activities in Gothenburg, Sweden.
- The Rhine Research Project.

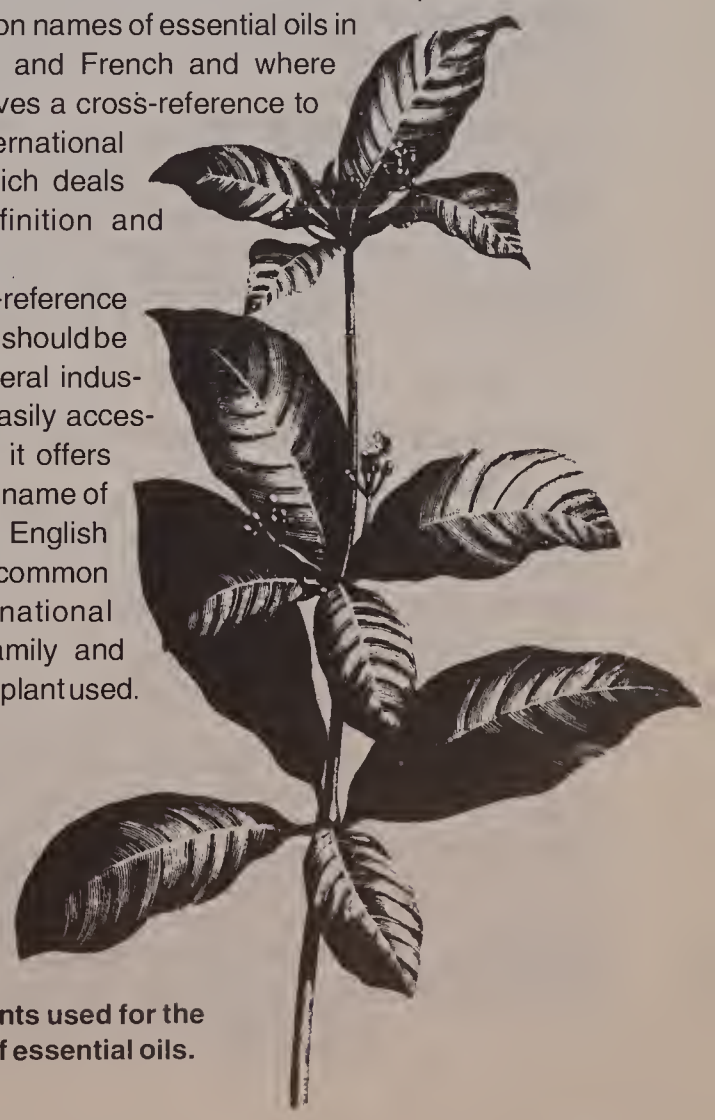
Industry and Environment is a publication of the United Nations Environment Programme Industry and Environment Programme Activity Centre — UNEP IE/PAC — in Paris. Each issue of this quarterly review focuses on a main theme. Articles by government officials, industry managers, scientists and representatives of non-governmental organizations share the results of research and experience, and present emerging technologies and future perspectives. Important events around the world in the field of the industrial environment are featured.

Oils. Absolutely essential?

Food additives, cosmetics and fragrances all have one thing in common. They are constructed with essential oils. One of the latest International Standards, ISO 4720, Essential oils Nomenclature, gives a list of the botanical names of plants used for the production of essential oils, together with the common names of the essential oils in English and French.

This International Standard includes an alphabetical index of common names of essential oils in both English and French and where applicable gives a cross-reference to the ISO International Standard which deals with the definition and specification.

It is a quick-reference source which should be useful in several industries. In an easily accessible fashion it offers the botanical name of the plant; the English and French common name; international reference; family and the part of the plant used.



ISO 4720 lists the botanical names of plants used for the production of essential oils.

ISO Standards

The following are some of the new international standards announced by the International Organization for Standardization (ISO) in recent issues of *ISO Bulletin*:

September 1992 issue of *ISO Bulletin:*

TC12	**Quantities, units, symbols, conversion factors**
ISO 31-0:1992	Quantities and units — Part O: General principles
TC28	**Petroleum products and lubricants**
ISO 5165:1992	Diesel fuels — Determination and ignition quality — Cetane method
TC34	**Agricultural food products**
ISO 10519:1992	Rapeseed — Determination of chlorophyll content — Spectrometric method
TC44	**Welding and allied processes**
ISO 9455-12:1992	Soft-soldering fluxes — Test methods — Part 12: Steel tube corrosion test
TC45	**Rubber and rubber products**
ISO 1795:1992	Rubber, raw, natural and synthetic — Sampling and further preparative procedures
ISO 6528-1:1992	Rubber — Determination of total sulfur content — Part 1: Oxygen combustion flask method (Revision of ISO 6528-1:1984)
ISO 6528-1:1992	Rubber — Determination of total sulfur content — Part 2: Sodium peroxide fusion method
TC61	**Plastics**
ISO 1210:1992	Plastics — Determination of the burning behaviour of horizontal and vertical specimens in contact with a small-flame ignition source
ISO 6252:1992	Plastics — Determination of environmental stress cracking (ESC) — Constant-tensile-stress method
TC79	**Light metals and their alloys**
ISO 9915:1992	Aluminium alloy castings — Radiography testing

October 1992 issue of *ISO Bulletin:*

TC12	**Quantities, units, symbols, conversion factors**
ISO 31-1:1992	Quantities and units — Part 1: Space and time
ISO 31-2:1992	Quantities and units — Part 2: Periodic and related phenomena
ISO 31-3:1992	Quantities and units — Part 3: Mechanics (Revision of ISO 31-3:1978)
ISO 31-4:1992	Quantities and units — Part 4: Heat
ISO 31-6:1992	Quantities and units — Part 6: Light and related electromagnetic radiations
ISO 31-7:1992	Quantities and units — Part 7: Acoustics
ISO 31-9:1992	Quantities and units — Part 9: Atomic and nuclear physics
ISO 31-12:1992	Quantities and units — Part 12: Characteristic numbers
ISO 31-13:1992	Quantities and units — Part 13: Solid state physics
TC28	**Petroleum products and lubricants**
ISO 3015:1992	Petroleum products — Determination of cloud point (Revision of ISO 3015:1974)
ISO 3448:1992	Industrial liquid lubricants — ISO viscosity classification
TC35	**Paints and varnishes**
ISO 2409:1992	Paints and varnishes — Cross-cut test
TC61	**Plastics**
ISO 4600:1992	Plastics — Determination of environmental stress cracking (ESC) — Ball or pin impression method
TC121	**Anaesthetic and respiratory equipment**
ISO 9360:1992	Anaesthetic and respiratory equipment — Heat and moisture exchangers for use in humidifying respired gases in humans
TC126	**Tobacco and tobacco products**
ISO 2881:1992	Tobacco and tobacco products — Determination of alkaloid content — Spectrometric method
TC147	**Water quality**
ISO 10530:1992	Water quality — Determination of dissolved sulfide — Photometric method using methylene blue
TC155	**Nickel and nickel alloys**
ISO 7530-7:1992	Nickel alloys — Flame atomic absorption spectrometric analysis — Part 7: Determination of aluminium content
ISO 7530-8:1992	Nickel alloys — Flame atomic absorption spectrometric analysis — Part 8: Determination of silicon content
ISO 9388:1992	Nickel alloys — Determination of phosphorus content — Molybdenum blue molecular absorption spectrometric method
ISO 11400:1992	Nickel, ferronickel and nickel alloys — Determination of phosphorus content — Phosphovanadomolybdate molecular absorption spectrometric method
TC184	**Industrial automation systems and integration**
ISO/TR 11065: 1992	Industrial automation glossary
TC193	**Natural gas**
ISO 6978:1992	Natural gas — Determination of mercury

Directory of numeric databases

The International Council for Scientific and Technical Information (ICSTI) has recently published *A Directory of Numeric Databases*. The directory contains a list of existing machine-readable numeric databases together with a minimal set of necessary data on each of these databases. The following fields are covered by the directory: astronomy, chemistry, crystallography, energy, engineering materials, geosciences, physics, spectroscopy and toxicology.

The directory includes an Appendix containing a questionnaire for transmitting information databases not listed in the directory. This information will be used for future editions.

ICSTI was established in 1952 under the name of ICSU AB (International Council for Scientific Unions Abstracting Board) but changed to ICSTI in 1984. Like its predecessor, ICSTI is an international non-profit organization whose aim is to provide a forum for all contributors to and users of the information network. It aims to increase accessibility to and awareness of scientific and technical information and, in particular, to deal with problems that arise at the interfaces between primary, secondary and tertiary information activities.

For further information about ICSTI and its publications please contact: Marthe Orfus, Executive Secretary, ICSTI, 51 Boulevard de Montmorency, 75016 Paris, France. Tel: +33 (1) 45 25 65 92. Fax: +33 (1) 42 88 14 66. Telex: ICSU 630 553 F.

IUPAC poster

Copies of an IUPAC poster (see p. 214 of the November 1990 issue of *CI*) are available **free of charge** to affiliates and members of IUPAC's commissions and committees. The poster is printed in blue and black on a white background and is approximately 42 x 59 cm in size.

If you would like to display one or more copies of the poster in your department or elsewhere please write to the Affiliate Affairs Secretary stating your name and address and how many copies of the poster you wish to receive.

ICOS 92

ICOS 92 Chairman Bob Young looks back on the Montréal conference and describes some of the highlights of the meeting.

The 9th International Conference on Organic Synthesis (ICOS 92) took place at the Université du Québec à Montréal (UQAM) 28 June to July 2 [see *Chem. Intl.* **15**, 11 (1992)]. Co-sponsored by UQAM and IUPAC, the conference attracted over 1000 participants from 36 countries and comprised a programme of 24 plenary and invited lectures together with 222 submitted papers from which 52 were selected for oral presentations.

The general theme was stereoselectivity in organic synthesis and symposia were held on: (1) Strategies and reagents for stereocontrolled organic synthesis; (2) Advances in asymmetric synthesis; and (3) Biomolecules in organic synthesis.

Strategies for stereocontrol in organic synthesis

Gilbert Stork led off the conference with a description of his elegant synthesis of the D-vitamin, calcitriol. His strategy involved using radical cyclization to build the core bicyclic unit with high stereocontrol.

Gerald Pattenden also described the ingenious use of radical cyclization to build complex polycyclic molecules in cascade radical macrocyclization-transannular processes and Janine Cossy described construction of polycyclic natural products by addition of radical anions derived by photoreductions of unsaturated ketones. Stereospecific construction of complex polycyclic structures such as steroids and triterpenes via macrocyclic Diels–Alder reactions were described by Pierre Deslongchamps.

Conference Chairman Bob Young greets participants during the ICOS 92 opening ceremony.

Organometallic reagents for synthesis

Another major theme of lectures on synthetic strategies was the development and optimization of organometallic reagents for synthesis. Ed Piers described the use of bifunctional organometallic reagents to construct polycyclic compounds. Among others, he demonstrated the use of vinylgermanium cuprates for Michael additions to α,β-unsaturated ketones followed by transmetallation with *n*-butyllithium. The rapid exchange of lithium for germanium allows formation of the vinyl anion and cyclization to proceed in competition with addition to the ketone.

Mark Lautens described organolithium and organocuprate mediated opening of bicyclic ethers as a strategy for stereoselective synthesis. Jean F. Normant described his highly diastereoselective use of bisorganometallic reagents such as allyl vinyl zinc species to provide coupled products of predictable stereochemistry. The versatile and elegant use of palladium to mediate construction of polycyclic structures from acyclic polyenes was described by Larry Overman. Multiple cyclizations can be effected in a cascade and can proceed with high diastereoselectivity.

Ian Paterson described the synthesis of complex acyclic and macrocyclic polypropionate derived natural products based on optimized strategies for stereoselective formation of syn–syn and anti-syn aldol adducts using tin and boron enolates. High enantioselectivity can also be achieved through the use of chiral borane catalysts to effect aldols starting with acyclic ketones.

An impressive combination of modern synthetic technologies were utilized by David Evans in his total synthesis of the complex organophosphate tumour promoter calyculin A. The construction utilized enantioselective aldol reactions as well as Stille and Wittig couplings to prepare the sensitive cyanotetraene part of the molecule.

Advances in asymmetric syntheses

This topic was a major theme of the conference. It was clear from many presentations that chiral asymmetric synthetic methods have reached a high level in the past several years and many approaches have now been exquisitely optimized to make the construction of essentially homochiral synthons from achiral starting materials, a practical reality for the modern synthetic chemist.

The power of chiral auxiliaries in synthesis was exemplified by lectures given by Leon Ghosez, Ben Feringa, and André Charette. Ghosez had employed keteneiminium and nitrosocarbamyl reagents prepared from chiral amides to effect 2+2 and 2+4 cycloadditions with high enantioselectivity. Such reagents provide versatile methods to prepare chiral cyclobutanones, amino acids and amino alcohols with enantiomeric excesses in some cases of >98%.

Feringa has made efficient use of 5-menthyl-oxy-2(5H)-furanones to provide enantiomerically pure synthons through 'crystallization induced epimerization'. These synthons undergo a number of transformations such as Diels–Alder cyclizations and Michael additions with high diastereoselectivity providing useful entries to β-aminoacids, β-lactams and natural products such as lignans. Charette described his use of sugars and related cyclic acetals as chiral templates for synthesis of polyols and cyclopropane derivatives again with excellent diastereoselectivity.

Chiral organometallic complexes

The development of chiral organometallic complexes as reagents for asymmetric synthesis has exploded in the last few years. Exquisite enantioselectivity has now been achieved, in some cases with catalytic methods using complexes of titanium, nickel, osmiuim, copper, palladium and related transition metals. Lectures by Yuri Belokon, Rudolf Buthaler, Tamio Hayashi, Koichi Narasaka, Dieter Seebach and Barry Sharpless all demonstrated impressive uses of such complexes.

It was particularly appropriate, considering the incorporation of the tartaric acid molecule and crystal form into the conference logo (and the fact that the conference site at UQAM fronted onto Place Pasteur!), that many of the complexes described are based on ligands derived from tartaric acid. Thus Narasaka described the catalytic use of tartrate-derived chiral 1,4-diols to form *in situ* titanium complexes which catalyse 2+2 and 2+4 cycloadditions of 3-alkenyl-1,3-oxazolidin-2-one with very high enantiomeric excesses (usually >90%).

Seebach described the catalytic use of similar complexes derived from tetraaryl dioxolane dimenthanols (TADDOLs) and tetraisopropoxy titanium to mediate asymmetric addition of organozinc compounds to compounds such as saturated and unsaturated aldehydes. These complexes also mediate enantioselective alanate reductions of ketones.

Duthaler described the use of cyclopentadienyltitanium-TADDOLs to mediate enantioselective additions of organolithium species to carbonyls and to effect aldol reactions as well as additions of allyl titanium species to carbonyls. Again, in many cases ee's of >90% are achieved.

Sharpless described the discovery and evolution of his chiral ligands for catalytic asymmetric osmylation and diol formation derived from dihydro quinidine and dihydroquinine. These reagents are now commercially available. Excellent ee values (> 90%) are obtained for diols formed from most olefins. This method is thus a significant advance on the Sharpless epoxidation procedure and is much more versatile because it is not limited to allylalcohols.

The use of nickel and copper complexes of proline amides for chiral synthesis of aminoacids was described by Yuri Belokon. Tamio Hayashi explained how binaphthyl-phosphonium derivatives can form palladium complexes which mediate catalytic asymmetric hydrosilylation of olefins which proceed with high enantiomeric excess.

Biomolecules in organic synthesis

The final theme of the conference was the use of biomolecules in organic synthesis. The use of enzymes for enantioselective hydrolysis, reduction of ketones, and oxidation of alcohols, and peroxidation of olipins was described by Stanley Roberts. Claudio Fuganti described the use of Baker's yeast for similar transformations and M. Bhupathy described the use of a specific esterase for efficient synthesis of a leukotriene D_4 antagonist, MK-0679. This industrial scale use of enzymes in synthesis involves the esterase hydrolysis of a prochiral diester to provide a single enantiomer acid ester in high chemical (>90%) and enantiomer (>99%) yield. Notably the synthesis of MK-0679 (the *R*-enantiomer) was significantly more efficient than the synthesis of the racemate (MK-571)! Clearly, use of enzymes in industrial synthesis has come of age.

While the use of enzymes to effect synthetic steps requires the survey of available enzymes in hopes of finding the optimum, Peter Schultz has decided to create his own enzymes in the form of catalytic antibodies, raised to appropriately designed transition state mimetics. His most impressive recent achievements are the raising of antibodies which catalyse Diels-Alder reactions and the use of a phosphonate hapten to raise antibodies which act like co-factors to mediate $NaBH_3CN$ dependant asymmetric reduction of keto amides with exquisite selectivity.

Finally, the conference was the venue of the first awarding of the Thieme–IUPAC Prize in Synthetic Organic Chemistry (a surprise to most attendees as this was arranged after printing the second circular). It was very fitting that the International Selection Committee should select Stuart Schreiber of Harvard as the example of "a scientist under 40 years of age whose research has had a major impact on the field ...'. His lecture was a brilliant overview of his research on the mechanism of action of immunosuppressive drugs such as Cyclosporin-A and FK-506. He has used synthetic and physical techniques to uncover the common target of the drugs, the complex of protein called immunophilins with the calcium and calmodulin-dependant phosphatase, calcineurin. This rather non-synthetic lecture, nonetheless inspired the audience with the realization of the power and potential of organic chemistry for the attack of biological problems.

ICOS 92 was held in Montréal.

Respiratory toxicology and risk assessment

Dr Birger Heinzow, Secretary of the IUPAC Commission on Toxicology (ComTox), was Official IUPAC Representative at the International Symposium on Respiratory Toxicology. This is his report.

The International Symposium on Respiratory Toxicology and Risk Assessment was held in Hannover, Germany, on 6–9 October 1992. The symposium was organized by the International Programme on Chemical Safety (IPCS) and the International Life Sciences Institute (ILSI) in collaboration with the German Federal Ministry of the Environment, Nature Conservation and Nuclear Safety, the Federal Health Office, the Fraunhofer Institute for Toxicology and Aerosol Research and in cooperation with the International Union of Toxicology (IUTOX).

In his welcoming address, Dr E. Smith (IPCS) included the greetings of IUPAC President Prof. Bard and pointed out the need for scientific cooperation of the different disciplines to come to a predictive risk assessment of understanding of the toxic mechanisms of industrial chemicals and hence the protection of human health and the environment.

The symposium was attended by more than 50 scientists and administrators from Europe, America, Canada, Asia and the former Soviet Union (Ukraine).

The main topics of the conference dealt with were:

- study design of inhalation testing;
- endpoints of inhalation toxicity;
- risk assessment and management of respiratory toxicology.

Working groups discussed and prepared reports and recommendations on:

- extrapolation and modelling;
- classification of chemicals;
- animal models.

The lung as a target organ for inhalable toxic compounds is still not fully understood and the extrapolation from animal experiments to man is limited. An internationally harmonized approach is needed to overcome the communication gap. As humans change their environment some factors can be controlled although a better methodology for risk assessment is needed.

The following is a summary of the principle outcomes of the meetings:

1. *Toxicity testing*: Within the need for harmonization, a flexible application of testing guidelines was recognized. A tiered approach was proposed for inhalation toxicity testing as a second route in toxicity testing consisting of intratracheal administration, followed by a 90-day study to identify the maximum functionally tolerated dose and a chronic 2-year study for those compounds of relevant inhalation exposure and with local effects in the respiratory tract.

Computer modelling might add to a better understanding of interspecies and intraspecies variation. Existing models should be made available to scientists and regulators. For the benefit of harmonization, an inventory is currently being compiled by IPCS which will analyse procedures for risk assessment in various countries. Aspects of animal welfare were also addressed with the recommendation to minimize the numbers and the stress within testing.

Inhalation toxicity testing was one of the topics of the Hannover Symposium.

2. *Endpoints and extrapolation*. Detailed study of lung structure, microfunction (distribution of enzymes and functional activity) and microdosimetry indicate a complex matrix and require a more detailed and micro-physiologically based assessment and extrapolation of toxic effects.

Open questions remaining include interspecies variability and human heterogeneity in response to chemicals, importance of overloading effects with regards to carcinogenic effects of particulates, predicting the value of *in-vitro* testing and testing for allergenicity and induction of hypersensitivity.

3. *Risk assessment*: The need for combination exposure evaluation was clearly addressed. It is likely in this context that every effect is a potential risk or adds to existing risk in a synergistic way. Current risk assessment is hampered by the fact that toxicology is successful in predicting harm but cannot predict safety. Inter- and intraspecies variation and mechanistic differences between high and low dose exposure toxicity are the main reasons for this dilemma. This can only be overcome through a better understanding of the underlying effects and their mechanisms, both toxicodynamics and kinetics.

Manuscripts of all given oral presentations were made available. The proceedings of the extremely well-organized symposium will be published in an ILSI monograph series by Springer.

Several personal contacts were made and used to explain the aims of IUPAC and the current terms of reference of ComTox. Of the ComTox projects, there was much interest in the forthcoming Glossary of Terms.

Names and Addresses

Full details (names, addresses, telephone/telex/fax numbers) of commission and committee chairmen and secretaries and IUPAC officers were published in *Chem. Intl.* **13**, 223-233 (1991). The IUPAC Secretariat has been notified recently of the following change:

Prof. R. S. Laitinen (Chairman, Commission on Nomenclature of Inorganic Chemistry). Tel.: +358 (81) 553 1611. Fax: +358 (81) 553 1603.

Computers in chemical research and education

The IUPAC-sponsored 10th International Conference on Computers in Chemical Research and Education (ICCCRE) took place in Jerusalem, Israel on 12–17 July 1992. Stephen Heller, Chairman of the IUPAC Committee on Chemical Databases reports that the meeting was attended by more than 100 scientists from over 20 countries, including Brazil, China, Papua New Guinea, Slovenia, and South Africa as well as Japan, USA and most European countries.

The conference was opened by Dr Gerson Metzger, a chemist and the Director General of the Ministry of Science and Technology. Professor J. Dubois gave the introductory plenary lecture on the history of the computer in chemistry. This was followed by papers covering most of the areas of the use of computers in chemistry. Most notable was the session on chemical education, including a round-table discussion with chemists from a number of countries describing their experiences in using this technology to improve chemical education.

Among the other highlights of the meeting was a talk on computer-aided drug design by Prof. G. Richards of Oxford University, UK, which was part of a memorial session to Amatazya Meyer, a brilliant chemist and member of the 10th ICCCRE organizing committee who died suddenly of leukaemia.

The 11th ICCCRE will be held in Paris, France in July 1995.

At the Jerusalem conference, chemists described their experiences of using computers to improve chemical education.

Jean-Marie Lehn at the Centenary of Geneva Conference, April 1992.

Lehn elected President of IOCD

Jean-Marie Lehn, 1987 Nobel Laureate in Chemistry and Professor at Collège de France (Paris) and Université Louis Pasteur (Strasbourg), has been elected President of the International Organization of Chemical Sciences in Development (IOCD) for a 2-year term. He succeeds Glenn T. Seaborg, also a Nobel Laureate and Associate Director of Lawrence Berkeley Laboratory. Seaborg was President of IOCD since its founding in Paris in 1982 and is now its President Emeritus.

Despite a busy research programme centred on molecular interactions, Lehn is concerned that fellow chemists in developing countries should have the means to bring their creativity to bear on the problems facing their countries, for example in the search for a new agent for the treatment of a tropical disease such as malaria or elephantiasis, or for the development of an effective drug for fertility regulation.

IOCD provides him with an outlet for this concern. The Organization is a small group of some of the world's top chemists — three others besides Lehn are Nobel Laureates — all volunteering their time, thought and energy to help chemists in developing countries do significant and relevant research in their own laboratories. IOCD links chemists in developing countries with internationally recognized specialists in collaborative research projects that not only channel funds to chemists in developing countries, but also alleviates their isolation by giving ready access to information and advice.

The IOCD central office is run by a volunteer who maintains collaboration between scientists through fax and modem. IOCD is funded from grants provided by agencies such as the US National Academy of Sciences, the European Community, the United Nations and US AID. These funds are allocated almost entirely to chemists in developing countries to help them buy the chemicals and apparatus needed for research.

For further information about IOCD please contact: IOCD (USA Office), P.O.Box 8156, Falls Church, VA 22041-8156, USA. Telephone and fax: +1 (703) 845 9078.

Affiliate Affairs

Comments invited on physical organic chemistry projects

The Commission on Physical Organic Chemistry invites readers to comment on its projects and suggest others it might undertake. Current projects of the Commission are outlined in its *Newsletter 1993* published in this issue of *Chem. Intl.* (pp. 65–67). This report also includes the names and addresses of Commission members to whom readers should direct their comments.

IUPAC publications

Affiliates are entitled to a 25% reduction and in some cases a 40% reduction on the cost of IUPAC publications except the scientific journal *Pure and Applied Chemistry*. A leaflet detailing IUPAC books currently available from Blackwell Scientific Publications has recently been distributed by the publishers to all *CI* readers. Further copies may be obtained from the IUPAC Secretariat.

Ties and scarves

IUPAC ties and scarves may be purchased from the IUPAC Secretariat by applying to the Affiliate Affairs Secretary. The colours for both are *either* maroon *or* navy (dark) blue. The ties cost USD 14.00/GBP 7.00 each and the scarves USD 12.00/GBP 6.00 (including postage and packing).

Please use the form (or a photocopy of it) published on page 170 of the September 1992 issue of *CI*. Alternatively please write to the Affiliate Affairs Secretary with your order stating the colour you require. A cheque made payable to IUPAC for the appropriate amount should be enclosed with your order.

How to contact commissions

IUPAC affiliates are entitled to communicate directly on scientific matters with the officers of IUPAC comissions. A full list of names and addresses of all commission officers for 1991–93 was published on pages 223–233 of the November 1991 issue of *CI*. Photocopies of this list are available upon request from the Affiliate Affairs Secretary.

IUPAC-sponsored conferences

If you are interested in attending a conference please apply directly to the conference organizers for the conference circulars and registration forms. An updated list of names and addresses of the organizers of all future IUPAC-sponsored conferences is given in the 'Conference Calendar' published in each issue of *CI*.

Address of IUPAC Secretariat

Please use the following address for all communications directed to the IUPAC Affiliate Affairs Secretary. If you are submitting a letter for publication in *Chemistry International* (*CI*), please indicate that the letter is 'Submitted for publication in *CI*.'

Affiliate Affairs Secretary
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Fax: +44 (865) 747 510
Telex: 83147 VIA OR G
attn. IUPAC
E-mail: IUPAC@VAX.
OXFORD.AC.UK.

Affiliate reduction of conference registration fees

It is a condition of IUPAC sponsorship of a conference that IUPAC affiliates are entitled to a 10% reduction or 'own members' rate on the registration fee for scientific participants. This concession is usually – but not always – announced in the conference circulars and indicated on the registration form.

To receive this reduction an affiliate must declare on the conference registration form that (s)he is an affiliate. Alternatively the affiliate should apply in writing to the conference organizer for this reduction stating that (s)he is an affiliate. Conference organizers may check with the IUPAC Secretariat that applicants for this reduction are currently registered as affiliates.

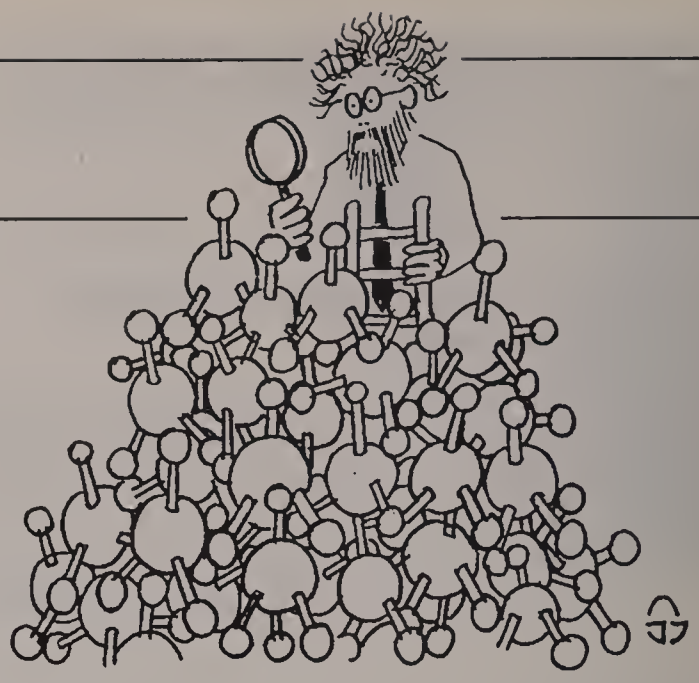
If an application for this reduction is refused, an affiliate should immediately notify the Affiliate Affairs Secretary and, if possible, forward copies of documentary evidence of this refusal

Polanyi Lecture for High Schools

The Canadian Company Associates of IUPAC sponsor an annual lecture for high school students called the Michael and John Polanyi Lecture for High Schools. The 1992 lecture was presented at the Bedford Institute of Oceanography, Dartmouth, Nova Scotia, on Wednesday 4th November.

The lecturer was Dr Michael A Quilliem of the Analytical Chemistry Section at the Institute for Marine Biosciences (National Research Council of Canada) in Halifax. His lecture, entitled 'Solving mysteries with analytical chemistry' drew upon his extensive experience in environmental research to convey to the high school students some of the excitement of modern analytical chemistry.

Letter to the Editor



Amount-of-substance, chemical amount, molar amount or molance?

Sir,

Recently Cvitaš[1] reported the discussions of the Commission on Physicochemical Symbols, Terminology, and Units (I.1) at Hamburg, including the suggestion of the name **chemical amount** as an alternative to **amount-of-substance**. Kohman[2] responded with surprise. Was this really still an issue?

I sympathize with their impatience that the problems of 1969 have still not been solved. However, they do not seem familiar with the 1969 recommendations of McGlashan[3], with later editions of the Green Book[4] nor with the recommendations on the International System of Units (BIPM 1991), into which the unit of amount-of-substance, the mole, was incorporated in 1971. Perhaps Kohman preferred, not without good reason, to ignore the more esoteric, or perhaps stupid, aspects of those recommendations. In my view, three mistakes were made in 1969.

The first mistake was the limitation placed on use of the long-established word **molar**, which resulted in an embargo on the terms **molar amount**, as used by Kohman, and **molar concentration**. McGlashan ruled that the word molar should only be used where the definition of the quantity had amount-of-substance in the denominator, for instance molar volume of a component (or substance) B, V_B/n_B. The terms molar amount and molar concentration are still widely used and are better understood than the recommended terms amount-of-substance and amount-of-substance concentration. They are certainly more elegant.

The second mistake was to coin the new term from words that have a long-established meaning and usage. Amount-of-substance does not mean 'amount of chemical substance'. One can speak of 'mass of a chemical substance' or 'volume of a chemical substance', but McGlashan seems to have intended us to speak of 'amount-of-substance of a chemical substance'. The Clinical Chemistry Division (VII) prefers to speak of 'amount-of-substance of a component' to reduce the confusion. In other words, one must compare the term amount-of-substance with the terms quantity of electricity, quantity of light, quantity of heat or quantity of energy, in which amount (or quantity) means an extensive kind-of-quantity.

The third mistake in the 1969 recommendations was the lack of thought for the consequences of the name amount-of-substance for the names of quantities derived from it. I have never seen a scientific report that states that the 'amount-of-substance concentration of ... is ... mol/L'. In 1975, the Commission on Quantities and Units in Clinical Chemistry (VII.2) requested permission to contract that term to **substance concentration**, which is in continuous use in reports from clinical laboratories, as well as in other branches of chemistry.

In 1988, Commission I.1 rightly realized that the old editions of the Green Book, with amount-of-substance concentration, were not being adopted by chemists. However I think Cvitaš, in his report on Commission I.1, is optimistic in feeling 'that the majority of chemists were on our side' and so 'we gave preference to "amount"' (e.g. amount concentration). Most chemists have not noticed the problem; I have never seen the term 'amount concentration' in a scientific report.

There are several possible solutions for the benefit of those (including myself) who want a more exact term than just **concentration**. The first option is for Commission I.1 to reverse its embargo on the use of **molar**, so that we may again use the terms molar amount and molar concentration. If we need an exact word for 'divided by amount-of-substance', we could introduce the word **molic**, in line with the words massic and volumic recommended by IUPAC in 1991 and by the International Organization for Standardization (ISO) in 1992 (standard ISO-31). Several correspondents suggested that change in the 1970s. A second option is to introduce a new short word for amount-of-substance. Several have been suggested: cheme; chemance; molance. A third option is for IUPAC to recognize the term **molarity**, as suggested by Kohman. I have never understood McGlashan's objection to the term.

At the moment, I am finalizing compilation of the *Compendium of Terminology and Nomenclature in Clinical Chemistry*, drawing together the threads of the recommendations published since 1967, and would appreciate some stability in the names of these terms. I would also appreciate hearing more opinions on this issue, to ensure that we do not repeat the mistakes of 1969 in the Compendium

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Commission & Committee News

Student monograph

The committee appointed to write the IUPAC 'Students' Manual' met during November at the IUPAC Secretariat in Oxford. At the previous meeting one year ago, the scope and contents of the book were agreed upon. The committee scrutinized and improved the first drafts of these sections. A complete manuscript will be available at the Lisbon General Assembly for the committee to finalize.

Casper Schutte, chairman of the committee, points out that the book is addressed to all those involved in the teaching and learning of chemistry at university first-degree level who want: (1) an overview of the fundamentals underlying selected fields of chemistry; (2) ready reference to authoritative definitions and descriptions of concepts, nomenclature, symbolism, etc.; (3) a basis for accessing IUPAC handbooks and recommendations. It will also be of interest to secondary school teachers who want to be informed about IUPAC's way of looking at chemistry and who are preparing students for tertiary level studies.

The monograph will provide a synoptic view of organized chemical knowledge — its principles, conventions, language and symbolism. It is being written by authoritative chemists who have participated in the preparation of IUPAC handbooks in physical, analytical, organic and inorganic chemistry and the work of the Committee on Teaching of Chemistry. The book will be based on existing internationally agreed IUPAC recommendations. Defining statements will be flagged for easy reference and there will be a comprehensive index.

Schutte believes the manual will present a refreshing and novel perspective on selected fields of chemistry. The one volume format will allow easy access to the operating framework of chemistry. He hopes that it will bridge the gap between the practising chemist and those teaching and learning chemistry.

Schutte stresses that the book is not a shortened, condensed compilation of existing IUPAC handbooks or a chemistry textbook. Nor is it a dictionary of chemistry, a set of data tables or a set of rules.

The 'Students' Manual' committee plans to have the complete manuscript ready for Lisbon.

The 180-page book will consist of 11 chapters:

1. Introduction
2. Fundamental measurement
3. General concepts
   - 3.1 Static
   - Atom, molecule, ion, element, compound mixture, states of matter
   - Formulae, nomenclature
   - Atomic and molecular structure, bonding, stereochemistry
   - 3.2 Dynamic
   - Chemical reactions and equations
   - Equibibria
4. Determination and description of structure
   - 4.1 Determination
   - 4.2 Description: substances, molecules, atoms
5. Naming substances
6. Changing substances
7. Measuring physical properties
8. Measuring change of physical properties
9. Measuring composition
10. Chemistry in industry
11. Tables.

Physical organic chemistry

The following report is based on *Newsletter 1993* prepared by the Commission on Physical Organic Chemistry

Introduction

Physical organic chemistry emerged a few decades ago, when organic chemists started to apply the methods and theory of physical chemistry to the study of organic reactions and their mechanisms. These studies prepared the ground for modern organic chemistry. The way organic chemists think about their science is very much dominated by physical organic concepts, and the teaching of elementary organic chemistry without using a physical organic approach is almost unthinkable.

The IUPAC Commission on Physical Organic Chemistry (Commission III.2) was established within the Organic Chemistry Division in 1973, when classical physical organic chemistry (i.e. mechanisms of reactions in solution) was at its height. Owing to the rapid development of the field, there was much confusion at that time with respect to the language of organic chemistry, and the commission's first effort consisted in establishing a glossary which defined the terminology to be used in physical organic chemistry.[1] Subsequent work of the commission dealt with typical problems related to reaction mechanisms,[2,3] but also with topics going beyond the field, such as the development of a nomenclature for organic transformations[4,5] and the nomenclature for hydrogen atoms.[6]

Recent Publications

During the past few years the commission has discussed problems concerning standards of publication. These discussions have resulted in the preparation of two documents, published in the form of technical reports, which recommend guidelines for the publication of research in experimental[7] and computational[8] organic chemistry. These guidelines are intended to assist journal editors in establishing sound editorial standards, and to encourage authors to meet such standards.

A technical report dealing with the physical properties of carbenes and carbene analogues[9] has also appeared recently.

Current Projects

Glossary of Terms Used in Physical Organic Chemistry, Revision 1993 (the Glossary): Most of the effort of the commission during the last 4 years was spent on this project. The terminology of the previous glossary has been updated, revised and considerably expanded. The document is on the way to outside reviewers, and is planned to be finalized at the 1993 IUPAC General Assembly in Lisbon.

Glossary of Class Names for Organic Compounds and Reactive Intermediates Based on Structure (Joint project with Commission III.1 on Organic Nomenclature)
This compilation recommends terms to denote classes of compounds, substituent groups and reactive intermediates, as contrasted to individual compounds. Such terms are widely in use, but their status of definition varies considerably. The document provides definitions of approved terms, introduces a few new ones, and recommends discontinuation of a selection of terms actually in use.

Commission III.2 originally intended to prepare, as part of the revision of the Glossary, a document on class names of reactive intermediates. In parallel, Commission III.1 was working on class names of organic compounds. As the work progressed, we realized that it was impossible to achieve complete and consistent documents and to avoid overlap by working in parallel, and the projects were merged. The final draft is now under external review.

Basic Terminology of Stereochemistry (Joint project with Commissions II.2, III.1, and IV.1)
This project, initiated by the late Victor Gold, former Chairman of Commission III.2, provides definitions for a selection of terms in stereochemistry which are in general use (or misuse). The progress of the work was greatly delayed due to the untimely death of its initiator. At that moment, the Divisional Committee decided to transfer the responsibility for the project to Commission III.1, and Prof. G. Moss agreed to act as convenor of a working party. There is still much controversy on some basic issues in stereochemistry, but it is hoped that the working party will come to a consensus and publish its final report within a year or two.

Structure–Reactivity Parameters and Relationships
This is a critical compilation of experimental data used in correlation analysis and quantitative structure–activity relationships (QSAR), widely applied in medicinal chemistry. It will provide researchers with a means to obtain with confidence with appropriate substituent constants for the analysis of their data and the appropriate mathematical tool for correct execution and interpretation. The project was initiated in 1989, and involves many specialists who are not members of the commission.

The final draft of the 'Glossary of Class Names for Organic Compounds and Reactive Intermediates Based on Structure' is now under external review.

Future projects

There has been much discussion on restructuring IUPAC to make it more efficient and more responsive to the needs of the scientific community and to the needs of society. Conceivably, the activities of the Division of Organic Chemistry might be reoriented, and so will be those of the commission on physical organic chemistry. For the immediate future, in the selection of projects, the commission is trying to keep a reasonable balance between the traditional fields of physical organic chemistry and the more recent developments; such projects often will have strong interdisciplinary character and will require participation of experts outside of IUPAC.

Current feasibility studies deal with terminology in theoretical chemistry and with modelling. In addition, the commission is looking for means to make available to a larger audience the projects on terminology which have been going on in the Division of Organic Chemistry; publication of a compilation on IUPAC "Terminology in Organic Chemistry" is envisaged. Other fields of interest in the future include solvent parameters, steric substituent parameters, language of supramolecular chemistry, physical methods in organic chemistry, and physical properties of radicals. Readers of this newsletter are encouraged to offer comments on these projects, and on others that they think the commission should undertake. Such comments may be addressed to the chairman or to the secretary, whose addresses are given below, or to any member of the commission.

Membership of the Commission

Chairman
Professor P. Muller, Department of Organic Chemistry, University of Geneva, 30 quai Ernest Ansermet, CH-1211 Geneva 4, **Switzerland.**

Secretary
Prof. W. Drenth, Ovidiuslaan 4, 3548 AW Utrecht, **the Netherlands.**

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Prof. J. Shorter, University of Hull, **UK**;
Prof. V.I. Minkin, Rostov University, **Russia**;
Prof. Z. Rappoport, Hebrew University, Jerusalem, **Israel**;
Prof. Y. Takeuchi, University of Tokyo, **Japan**.

Associate Members
Prof. P.N.I. Ahlberg, University of Goteborg, **Sweden**;
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Prof. O.M. Nefedov, Zelinski Institute of Organic Chemistry, Moscow, **Russia**;
Prof. C.L. Perrin, University of California, San Diego, **USA**;
Dr D.J. Raber, National Academy of Sciences, Washington, **USA**;
Dr J. Zdysiewicz, *Australian Journal of Chemistry*, Melbourne, **Australia.**

National Representatives
Prof. J.J. Humeres Allende, Campus Univerisity Trinidade, Florianopolis, **Brazil**;
Prof. T.T. Tidwell, University of Toronto, **Canada**;
Prof. X. Jiang, Shanghai Institute of Organic Chemistry, **China**;
Dr R. Sabbah, CNRS, Marseille, **France**;
Prof. E. Baciocchi, University "La Sapienza", Rome, **Italy**;
Prof. J.A. Silva Cavaleiro, University of Aveiro, **Portugal**;
Prof. J. Suh, Seoul National University, **Republic of Korea**;
Prof. J.-L. Abboud Mas, CSIC, Madrid, **Spain**;
Prof. O. Tarhan, Orta Dogu Technical University, Ankara, **Turkey**;
Prof. M. Tisler, University Edvard Kardelj of Ljubljana, **Slovenia**.

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8. Guidelines for the Presentation of Quantum Mechanical Computational Data in Organic Chemistry (Technical Report)' *Pure Appl. Chem.* **64**, 1203 (1992).
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Reliable Hammett σ-constants

The Commission on Physical Organic Chemistry (III.2) met in Ithaca, New York, USA, on 7–9 August 1992. The Commission heard that the 'Glossary of terms used in physical organic chemistry' has been revised and expanded by Prof. Müller with the help of several members.

Excellent progress had been made by the Working Party on 'Structure reactivity parameters and relationships' chaired by Prof. Shorter. Tables were presented of the best values which can at present be provided for σ-constants based on the ionization of benzoic acids in water at 25°C. The final document will be examined by external refereees.

Commission members contributed to the project 'Basic terminology of stereochemistry' as well as to the project 'Class names'. The feasibility study of the project 'Terminology of theoretical organic chemistry' was completed and a working party chaired by Prof. Minkin will execute this project. The project 'Modelling' is still in its feasibility stage. Several future projects were suggested. For a number of them pre-feasibility studies are in progress.

The next meeting will be in Lisbon, Portgual, on 5–12 August 1993.

Dr Wiendelt Drenth

Atmospheric chemistry

The Commission on Atmospheric Chemistry (VI.4) met in Moscow and Novosibirsk, Russia, on 18–25 July 1992. The meeting was combined with a Workshop on the Assessment of the Uncertainties in the Projected Concentrations of Methane in the Atmosphere (see pages 48–49).

The conclusion of the Workshop was that the uncertainties in the sources as well as the sinks of methane are much larger than previously assumed. The contribution of methane to the Greenhouse Effect will increase in the future, due to expanding population and agricultural and industrial activities. The uncertainties in future predictions of the methane concentration in the atmosphere is so large, that new approaches must be found to measure methane emissions and to validate our estimates of area and time averaged emission strengths.

Following the workshop, the Commission held its annual meeting in Novosibirsk upon the invitation of the Institute for Chemical Kinetics and Combustion, courtesy Profs. V. A. Koptyuk and N. M. Bazhin.

The Commission was very pleased with the progress of a number of projects. The Review of Analytical Methods for the Measurement of Contaminants in the Workplace has been completed. The project evaluation and recommendation of 'Units for Use in Atmospheric Chemistry' has progressed very well and the final version will be compiled based on the (minor) comments of experts and editors. Articles on local air pollution problems have been written and will be submitted for publication in *CI*.

The Commission decided that the next assessment workshop should be devoted to local environmental problems in the developing countries.

Following the meeting, Commission members spent two days at the Limnological Institute of the Russian Academy of

Commission VI.4 sample the atmosphere on the banks of Lake Baikal. They reported that air in the region has continental background quality and appears to be a perfect site for a continental baseline monitoring station.

Sciences in Irkutsk. One day was filled with presentations on the scientific work of the institute, the other included a trip to Lake Baikal, where the institute has a station. Lake Baikal may be overfished, and at its southern flank a power plant and a cellulose production plant give rise to local pollution. However, most of the 400 km stretch of the lake appears to be untouched by the evils of civilization. It was good to hear that the air in that region has continental background quality, and it appears to be a perfect site for a continental baseline monitoring station.

The next meeting of the Commission will be held in Lisbon, Portugal, on 5–12 August 1993.

Dr Sjaak Slanina and Prof. Peter Warneck

Isotope specific measurements as references

The IUPAC Limited Lifetime Commission on Isotope Specific Measurements as References met at the University of Birmingham, UK, from 30 June to 2 July 1992. Prof. De Bièvre welcomed members. The minutes of the second Commission meeting in Hamburg and the proposed agenda for the Birmingham meeting were approved.

De Bièvre disclosed that the interpretation of regulatory values (related to data reliability) had been added to the Commission's terms of reference. Group discussion centred on tolerance levels, decision levels, and how to document methods and uncertainties using the International Measurement Evaluation Programme (IMEP).

All the current IMEP rounds were then discussed with particular emphasis on action items from the last meeting and progress towards completion of the projects. These activities are summarized as follows:

1. *IMEP Round 2: Cadmium in plastics.* Dr Lamberty presented the data from the participating laboratories. This project is essentially complete and only data analysis is subject to change as different methods of presenting the data are evaluated.

2. *IMEP Round 3: Trace elements in water.* Dr Moody finished the packaging of the two water samples and Lamberty had received these and prepared them for distribution.

3. *IMEP Round 4: Trace elements in serum.* Prof. Savory did not attend the Birmingham meeting. However, it was known that the samples were ready for distribution. Some of the isotope dilution reference measurements were not complete. However, it was agreed that there should be no further delay in the sample distribution. The reference values will be available before the cooperating laboratories report their data.

4. *IMEP Round 5: Iron in blood.* Dr Perrin from the Los Alamos Scientific Laboratory (LASL) reported on progress in the isotope dilution measurements for iron made in cooperation with the Central Bureau for Nuclear Measurements (CBNM) and De Bièvre. These samples are also ready for distribution and all measurements could be completed by the next meeting.

Progress on all of these projects is proceeding at the expected pace. The Commission then discussed possible future IMEP rounds. De Bièvre noted the importance of the Commission work in relation to ISO/IUPAC activities pertaining to the traceability and accuracy of important measurements. Another activity influenced by Commission activities is the IUPAC Environment Programme. Members agreed upon the importance of these measurements and that they should continue.

In conclusion, all necessary technical objectives to achieve successful results for the Commission's activities were discussed. Specific needs to meet the objectives were noted.

The next meeting will be held in Lisbon, Portugal on 7 August 1993.

Dr John R. Moody

Chemistry and industry

The Committee on Chemistry and Industry met in Stockholm on 4–5 September 1992. Seventeen countries are now represented on the Committee.

Three major topics were discussed at the meeting:

1. A second workshop on Safety in Chemical Production will be held in Yokohama, Japan in 1993 which will be followed by a third workshop in the USA in 1995.

2. The Committee decided to study the feasibility of organizing events on 'Chemistry for Life' to celebrate in 1994 the 75th Anniversary of IUPAC. It is proposed that these events will be held in 17 countries represented on COCI and also in the three regions: Asia, Europe and USA.

3. COCI has stressed the interest that coordination should go on across Commissions and Divisions in domains such as materials and the environment. It has been suggested that the by-laws of IUPAC should be modified in order to extend the maximum duration of membership for COCI officers from 10 to 12 years.

The next COCI meeting will be held in Lisbon, Portugal, on 8–9 August 1993.

Dr René-Paul Martin

Oils, fats and derivatives

The Commission on Oils, Fats and Derivatives met in Budapest on 9–11 September 1992. This year's Working Report was thin compared to previous ones, Chairman Albrecht Dieffenbacher remarked in his report, but comparing the status of the projects it follows that an enormous amount of methods and reports on collaborative studies has been produced. This resulted in the 1st Supplement of the 7th edition of the *Standard Methods for the Analysis of Oils, Fats and Derivatives* which contains 28 new methods. Our work will, however, not come to an end, on the contrary 'Work is going on with new elan!'

A new collaborative study will be organised by Dieffenbacher for the determination of *trans* fatty acids by capillary gas chromatography. Marshall Pike reported on the progress with the second collaborative study on the method for detection of contamination of edible oils transported in bulk. On the basis of the two collaborative studies held in 1991 and 1992, contaminated oils have already been analysed successfully. As soon as sufficient results have been collected the method will be finalized and published.

Pike further volunteered to co-ordinate the working group to study the determination of residual chlorinated hydrocarbons in edible oils to replace Gert Ostermann. Another working group co-ordinated by Ostermann who had to resign from the Commission will now be co-ordinated by Carmen Dobarganes García our new National Representative (NR) from Spain: Assessment of methods for detection of thermally treated oils. Several standard methods available to our Commission will be used for the study. Herbert Wessels the co-ordinator of the joint working group on determination of lipid oxidation also had to resign due to the new rule: "No NR for a country already represented by a member". The work is considered finished with the issue of the report "An Assessment of Lipid Oxidation in Foods".

Karsten Stig-Andersen will co-ordinate a study on oxidation stability of oils and fats, using the new apparatus "Oxidograph". Patric Dysseler reported on the collaborative study on the determination of cadmium by atomic absorption spectometry. The collaborative study will have to be repeated with a larger number of participants in order to fulfil the IUPAC rules for collaborative studies.

Zdenék Svoboda presented the report on the collaborative study for the determination of chlorophyll by the spectrophotometric method. The conclusion was that the method can be published on the basis of the collaborative studies in 1991 and 1992.

Stig-Andersen reported on the 1992 collaborative study with the rapid method for the determination of the unsaponifiable matter which will in future be indicated as "unsaponifiable index". Also in this case the collaborative study will be repeated to deal with low contents of unsaponifiable matter occurring in, for example, fish oils.

On behalf of Gerhard Zwerenz who was unable to attend the meeting, Dieffenbacher presented the results of the questionnaire which was organized by Zwerenz for the project Review of Standard Methods in Relation to the Impact on the Environment (the Commission was granted an extra budget of USD 4000 for this project!). From the proposals made by Zwerenz new working groups were set up.

Calculation of fatty acid composition in % mass/mass from gas chromatography data co-ordinated by Stig-Andersen;

Replacement of toxic solvents by non-toxic solvents in methods for analytical key values to be co-ordinated by Zwerenz;

Minimization of the acid value determination using modern electrochemical equipment, co-ordinated by John Holm.

Finally it should be mentioned that Joyce Beare-Rogers reported by writing that the joint working group of the International Union of Nutritional Sciences (IUNS) and IUPAC Lexicon for Lipid Nutrition and Nomenclature is making good progress. A draft report on the IUNS-IUPAC Lexicon will be circulated for comments.

The next meeting will be held in Lisbon, Portugal on 8–10 August 1993.

Pim Hendrikse

Commission VI.3 met in Budapest in September 1992.

The Beijing Congress

Chemistry for the 21st Century —The Central Science

The 34th IUPAC Congress, organized by the Chinese Chemical Society (中国化学会), will take place in Beijing, China from Sunday 15th to Friday 20th August 1993. Sessions will be devoted to organic chemistry, analytical chemistry, inorganic chemistry, polymer chemistry, petrochemistry, physical chemistry, computer in chemistry and chemistry teaching.

Introduction

The 34th IUPAC Congress will be held at the Beijing International Convention Center from Sunday 15th to Friday 20th August 1993. The Congress has a wide coverage of different fields in chemistry and will provide a critical survey of the current state of knowledge and future trends in eight fields of chemistry. Plenary and invited lectures totalling about 100, will be presented by prominent chemists invited from all over the world. Each section will consist of invited lectures, oral contributions and posters.

Social programs are planned for active and accompanying participants and a technical exhibition will be held in the Center at the time of the Congress.

The official language of the Congress is English. No translation facilities will be available.

The scientific program

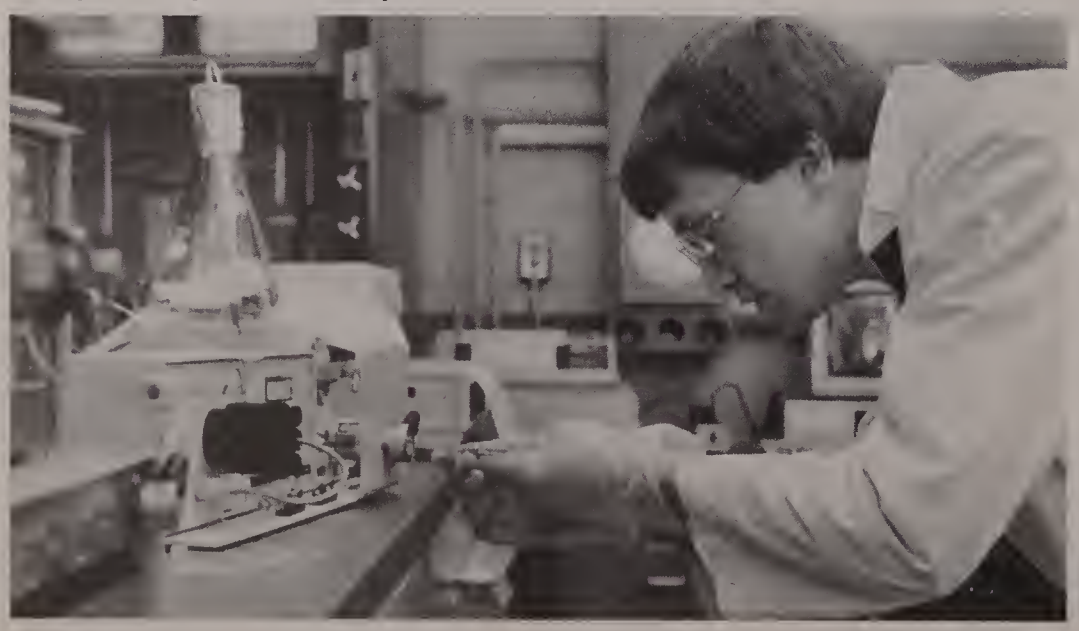
The scientific program is devoted to the following eight sections of chemistry:

Section 1. Life science and organic chemistry
- Chemistry for more food — plant hormones and growth regulators, agrochemicals, food chemistry
- Chemistry for better health — natural drugs, molecular design and synthesis of pharmaceuticals
- Clinical chemistry
- Pharmaceutical chemistry
- Chemistry of bioactive molecules, nucleic acids, proteins, polypeptides and carbohydrates
- Enzymes and their interaction with substrates
- Chemistry in biotechnology
- Organic chemistry of natural products
- Physical organic chemistry

Section 2. Chemistry for a better environment and analytical chemistry
- Environmental monitoring and protection
- Cleaner atmosphere, water and soil
- Safety in chemical production, handling hazardous materials
- Safe disposal and recycling of wastes
- Chemical separation and concentration
- Various optical and resonance methods of analysis
- Electroanalytical chemistry
- Chromatography, mass spectrometric analysis and various combination techniques
- Bioanalytical chemistry, pharmaceutical analysis
- Chemical analysis and protection of cultural relics

Section 3. Chemistry of advanced materials and inorganic chemistry
- Advanced alloys and intermetallic compounds
- High performance ceramics
- Optoelectronic materials and functional crystals, thin films
- Molecular design for new advanced materials
- Coordination chemistry and Bioinorganic chemistry
- Organometallic and cluster chemistry
- Rare-earth chemistry and advanced materials
- Nuclear and radiochemistry
- Solid-state chemistry

Section 4. New polymer materials and macromolecular science
- Polymer materials with special optical, electrical, biological and other functional properties
- Polymeric liquid crystals, composite and hybrid materials
- Polymerization, characterization, structure — property relationships and applications of polymers



Air pollution laboratory. Section 2 of the Congress is devoted to environmental and analytical chemistry.

Section 5. Petrochemistry, fossil fuels chemistry and catalysis

- C1 chemistry, activation of small paraffin molecules
- Conversion of petroleum residues
- Heterogeneous and homogeneous catalysis, new catalysts
- Photo-, electro- and artificial enzyme catalysis
- Theoretical and experimental studies on mechanism of catalysis

Section 6. Physical chemistry

- Thermodynamics and energy sources
- Structural chemistry and modern spectroscopy
- Quantum chemistry and statistical chemistry
- Chemical kinetics and molecular dynamics
- Electrochemistry, photochemistry and electrophotochemistry
- Colloid and surface chemistry

Section 7. Chemical information and computers in chemistry

- Data banks and processing
- Chemometrics
- Application of computers in chemistry and chemical engineering
- Simulation and modelling

Section 8. Popularization and education of modern chemistry

- Modernization in teaching chemistry
- Experimental chemistry teaching
- Computer aids in chemistry teaching

Sessions on these sections will take place both concurrently and sequentially. Contributions to all sessions are invited. Papers dealing with topics outside those of the sessions are also welcome.

Contributed papers are accepted in the form of either oral or poster presentations which will carry equivalent scientific status in the program and in the resulting publication.

Plenary lectures

There will be seven to nine plenary lectures including those by IUPAC Vice-President Professor H.A. Staab and Nobel Laureate Professor Yuan T. Lee and Professor Richard R. Ernst. The topics of the plenary lectures are:

Prof. Yuan T. Lee (Univ. of California, Berkeley, USA). Bond Selective and Mode Specific Chemical Reactions Through Laser Excitation.

Prof. Richard R. Ernst (ETH, Switzerland). Recent Developments in NMR Methodology for the Study of Molecular Structure and Dynamics

Prof. H.A. Staab (IUPAC, Germany). Chemical Studies on the Primary Processes of Biological Photosynthesis.

Prof. Ronald Breslow (Columbia University, USA). Biomimetic Chemistry.

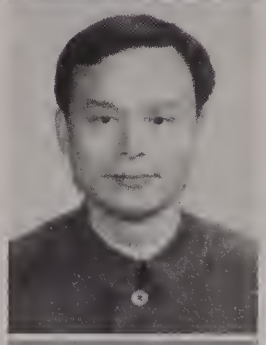
Prof. Xikui Jiang (Shanghai Inst. of Org. Chem., China). New Concept for Studying and Understanding the Aggregation, Co-Aggregation, De-Aggregation and Self-Coiling of Organic Molecules. Why are Cholesterols and Triglycerides Culprits of Arteriosclerosis?

Dr W. Graham Richards (Oxford University, UK). Computer Aided Drug Design.

Prof. D.S. Yan (Chinese Acad. of Sci., China). Material Chemistry Studies — Their Role for Advanced Nitride Materials Design.

Professor Xiaotian Liang — President of IUPAC Congress and Executive President of the Chinese Chemical Society

Professor Aoqing Tang — Chairman of the International Advisory Committee, IUPAC Congress and President of the Chinese Chemical Society



Professor Yadong Hu — Chairman of the Organizing Committee of the IUPAC Congress and President of the Chemical Society

Professor Kui Wang — Treasurer of IUPAC Congress and President of the Chinese Chemical Society

Professor Xingqi Song — Secretary-General of IUPAC Congress and Deputy Secretary-General of the Chinese Chemical Society

Professor Lianghe Shi — Deputy Secretary-General of the IUPAC Congress

Professor Qifeng Zhou — Deputy Secretary-General of the IUPAC Congress

Plenary lecturers, from left: Profs Jean-Marie Lehn, Heinz Staab and John Polanyi.

Professor Kenichi Fukui will attend the Congress. Prof, Jean-Marie Lehn of Université Louis Pasteur, France and Professor J.C. Polanyi of University of Toronto, Canada are planning to attend and deliver plenary lectures.

General information

The registration fees before/after 31 March, 1993 are USD 350/390 for Congress participants, USD 315/350 for IUPAC affiliates, USD 180/220 for students and USD 140/180 for accompanying person. Payment of registration fee entitles the participant to participation in all scientific sessions, Preprint Book, Final Program, a welcome reception, a banquet, coffee breaks and an evening cultural performance. The appropriate registration fee entitles the accompanying person to a welcome reception, a banquet, an evening cultural performance and an exquisite souvenir.

For hotel accommodation, participants will be accommodated either in the Continental Grand Hotel which adjoins Beijing International Convention Center or in the Grand Hotel Beijing which is a five-star hotel. Prices per night range from USD 50 to 150 for a single room and USD 100 to 320 for a double room. Accommodation for students in a student apartment is also available at USD 40.

Beijing is a city with a long history and is China's main political, economical and cultural centre. Within the city and in the outlying areas are many sites of historic interest, besides parks and gardens with unique traditional architecture and charming scenery. The Great Wall, one of the world's oldest engineering projects on a gigantic scale, is accessible on the western outskirts of Beijing Municipality. Pre-Congress and Post-Congress tours to other cities will be organized.

The climate in August in Beijing is usually fine. The temperature in August is about 19°C at night and 29°C in the daytime. The hotel and Convention Center are air-conditioned.

All correspondence concerning the Congress should be addressed to: Prof. Xinqi SONG, Secretariat of 34th IUPAC Congress, c/o Chinese Chemical Society, P.O. Box 2709, Beijing 100080, China. Phone/Fax: +86 1 2568157

Beijing International Conference Centre and Continental Grand Hotal (above); Congress Hall (top right); Great Wall of China (centre right); Lijiang River (bottom right).

Conferences

Carotenoids
Trondheim, Norway
20–25 June 1993

IUPAC SPONSORED

The 10th International Symposium on Carotenoids will be held at the Chemistry Department of the Norwegian Institute of Technology, Trondheim, on 20–25 June.

The first Carotenoid Symposium was also held in Trondheim in 1966 as a pre-symposium to the IUPAC-sponsored Natural Products Symposium in Stockholm, Sweden. Since then, a series of International Symposia on Carotenoids have been held in New Mexico, USA (1969); Cluj, Romania (1972); Bern, Switzerland (1975); Wisconsin, USA (1978); Liverpool, UK (1981); München, Germany (1984); Boston, USA (1987) and Kyoto, Japan (1990).

The orginal purpose of these meetings was to discuss and disseminate research results concerning carotenoids and to stimulate research in the field of carotenoid chemistry and biochemistry. More recently the trend has been towards biological, biotechnological and functional aspects of carotenoids for which chemistry still serves as the basis. The Trondheim meeting this year will cover all major aspects of research including retinoid chemistry.

The scientific programme will include about 8 plenary lectures and 12 invited lectures following by discussion periods. There will also be two poster sessions. To cover the expanding field of carotenoids, 12 sessions divided into two parallel series will be organized. The topics are:

Series 1
- Biosynthesis, molecular biology
- Metabolism, metabolites
- Function (including vision)
- Nutrition, medical applications
- Retinoids
- New topics (conductivity, geochemistry, etc.)

Series 2
- Chemical synthesis
- Analysis, spectroscopy, chromatography
- Isolation, structure, chemosystematics
- Photosynthesis
- Biotechnology, commercial applications
- Aquaculture, feed, formulation.

The official language of the Symposium will be English; no facilities for simultaneous translation will be available.

A registration fee of around NOK 1500 will be charged. IUPAC affiliates are entitled to a 10% discount. Accommodation has been reserved at the Royal Garden Hotel for the majority of expected participants at a rate of about NOK 790 per night for a single room with bath.

Trondheim is situated at the Trondheimsfjord, not far from the Arctic Circle. It can be reached by car, train, boat and plane. Travelling by train within Norway provides an excellent opportunity for sightseeing. Trondheim is known as the Capital of Viking Norway. It was founded in AD 997 by the Viking King Olav Tryggvason and the city was the capital of Norway through the Middle Ages. The modern city dates back to 1681 when General Cicignon redesigned the city after a series of disastrous fires. Today Trondheim is a national centre of technical education, research and development.

The weather in June is normally mild, with 24 hours' daylight. The temperature may vary between 10 and 20 C and rain is possible.

Environment, analysis and waste management
London, UK
10–13 May 1993

IUPAC SPONSORED

The multi-session International Conference on Environment, Analysis and Waste Management will be held at the Wembley Conference Centre, North London, on 10–13 May. The conference is being organized by Labmate Ltd, and is sponsored by IUPAC, The Royal Society of Chemistry, Institute of Medical Laboratory Sciences, Institute of Energy, The Conservation Foundation, The Institute of Science Technology, British Occupational Hygiene Society, International Professional Association for Environmental Affairs (IPRE), The Marine Conservation Society, Indoor Air International, Robens Institute of Health and Safety, and the British Standards Institute.

The conference is one of a series which has been held in the London area since 1980.

The Wembley Conference Centre is situated next to the world-famous Wembley football stadium. There is a good metro link and other public transport facilities to enable delegates to explore London and the surrounding areas. The temperature in England in May can range from 12 to 20°C and rain is likely.

Wembley Conference Centre.

The conference will focus on a wide range of environmental topics, including:

1. Reproductive toxicology
2. Risk assessment of chemicals
3. Environmental global perspectives
4. A sustainable environment especially resulting from air travel
5. Toxicology — the essentials for mankind's survival
6. Economics, information and law
7. UK's Environmental Protection Act 1990
8. Environmental toxicology
9. Environmental priorities in Central an Eastern Europe
10. Waste management
11. Environmental auditing
12. Laboratory safety and accreditation
13. Information technology for analytical chemists
14. Indoor environment
15. Coastal and estuarine pollution.

The analytical chemistry symposium will cover the following topics:

- Sensors and sampling
- Biomedical analysis
- Modern mass spectrometry
- Environmental analysis
- Air analysis
- Analysis of contaminated land
- Environmental mass spectrometry.

In all, there will be over 40 modular half-day symposia in seven parallel sessions.

The keynote speakers (afternoon of Monday 10 May) will include His Excellency Sandor K. Keresztes (Minister for Environment and Regional Policy, Hungary), Dr Garislav Shkolenok (UNEP/IRPTC, Geneva), Dr Norman King (Department of Environment, London), Mr Duncan Fisher (East-West Environment, London), and Mr R. C. I. Bate (ICC, UK).

The official language of the conference will be English and the offical carriers will be Austrian Airlines.

There will be no formal social programme but there will be ample opportunities for delegates to meet informally at lunch-time discussion meetings, at receptions, or during the accompanying exhibition.

In addition, there will be a poster session for which late offers are still being accepted. A 100–250-word synopsis and title should be submitted to Mervyn Richardson at the address shown in the conference calendar.

The fees for the conference are based on GBP 71.00 for each half-day session, together with free admission to the exhibition. IUPAC affiliates are entitled to 10% discount of the fees.

Accommodation will be available in nearby hotels.

Multiphoton processes
Québec, Canada
24–30 June 1993

IUPAC SPONSORED

The 6th International Conference on Multiphoton Processes (ICOMP VI) will be held at the Université Laval, Quebec City, Canada.

This meeting will bring together chemists and physicists who use intense laser beams to investigate the behaviour of

Université Laval, Québec City, Venue of ICOMP VI.

reacting atoms and molecules. Traditionally, this series of meetings has provided the most timely reports possible. This is achieved by fixing the agenda as close as possible to the time of the meeting. Thus reports usually include work done within the last few months.

The parts of greatest interest to the chemists will provide reports from leading researchers from around the world on topics in photochemistry that could not be investigated before the development of lasers. These include ground electronic state photochemistry, ionization — both single and multiple, and species or isotopically selective photochemistry.

The reports will include discussion of assessments and applications of fundamental topics in quantum mechanics. For example, ultra-short laser pulses are being used to monitor transient states of systems such as reacting molecules, the basic aspect of chemistry. High field physics using laser intensities beyond 1018 W/cm^2 will explore the relativistic effects in laser interaction with atoms and molecules — breakthroughs are expected.

The topics to be considered at the conference will include (but will not be limited to) those listed below:

- multiphoton ionization of atoms and molecules;
- multiple excitation of atoms and molecules;
- multiphoton dissociation of molecules;
- coherent control of molecules;
- above threshold ionization and dissociation;
- high-order harmonic production and XUV radiation processes;
- ultra short laser pulse effects in multiphoton ionization of atoms and molecules;
- laser-electron, ion interactions in ultrahigh laser fields;
- stabilization of atoms in high laser fields;
- high field dressing of molecules.

Oral presentations will consist of only plenary lectures, while each poster presenter will have 2 minutes with one graphic.

Lectures will be presented in English

The registration fees are USD 300 for scientific participants and USD 100 for students.

Blocks of rooms have been reserved on the University site, at a price of CAD 35 (USD 29 approx.) per night including breakfast. Participants will enjoy taking a 5-minute walk through the quite cité universitaire to reach the conference site. Reservations in hotels out of the University site are also possible.

The St Lawrence River in Québec City is the cradle of French civilization in North America. It is renowned for many tourist attractions of historical, geographical and economic interest. Vieux Québec (Old Québec) was the first North American city to be included on UNESCO's prestigious world heritage list.

At the end of June, the temperature is mild, the average is 12°C (54°F) during night and up to 24°C (75°F) during day.

Quebec is served by one airport located at less than 15 minutes by car from Université Laval.

Bioorganic chemistry
Fukuoka, Japan
6–10 June 1993

IUPAC SPONSORED

The 2nd International Symposium on Bioorganic Chemistry will be held in Fukuoka Sun Palace Convention Center, Fukuoka, Japan from Sunday 6 June to Thursday 10 June 1993. The official language of the symposium will be English.

The City of Fukuoka (population 1.2 million) lies some 1000 km west of Tokyo and is the capital of Fukuoka Prefecture. The city is located on the northern coastal part of Kyushu Island, one of the four major Japanese islands.

The 1st International Symposium was held in New York City in May 1985 under the joint sponsorship of IUPAC and the New York Academy of Sciences. Since then bioorganic chemistry research has expanded along with biological phenomena and functions. To reflect this increased activity, the 2nd Symposium aims to cover broader interdisciplinary fields.

The symposium will cover all aspects of bioorganic chemistry including applications. Special attention will be paid to the following rapidly developing areas of research:

1. Enzyme functions and modelling.
2. Biological and artificial receptors.
3. Biosynthetic pathways and biologically active materials.
4. Organic chemistry aspects of genetic engineering.
5. Biopolymers and artificial supramolecular assemblies.
6. Simulation of biochemical processes.

The scientific programme will include 30 invited lectures, poster contributions and the following five plenary lectures:

- Abzymes and enzymes (Stephen J. Benkovic, USA).
- Glycobiology — Concepts, technology and the future (Raymond A. Dwek, UK).
- Rational design of DNA ligands for artificial control of gene expression (Claude Hélène, France).
- Bioorganic studies on receptors (Koji Nakanishi, USA).
- Molecular recognition by artificial receptors (David N. Reinhoudt, The Netherlands).

The plenary and invited lectures will be published in *Pure and Applied Chemistry*. The registration fees (after 1 March 1993) are JPY 50 000 for IUPAC affiliates and members of The Chemical Society of Japan and supporting societies; JPY 60 000 for non-members, JPY 25 000 for students and JPY 10 000 for accompanying persons. The fee (except for accompanying persons) covers admission to all scientific sessions and complimentary social events, and includes a symposium programme and book of abstracts.

Hotel accommodation has been reserved at rates ranging from JPY 6900 to JPY 16 070 (single) or JPY 8400 to JPY 13 810 (double) per person. The social programme includes a mixer, banquet and excursions. There is also an accompanying persons' programme.

Many ancient shrines and temples are found in Fukuoka City along with several parks creating a spacious atmosphere. Fukuoka offers many excellent opportunities for marine recreation such as Shikanoshima Island and Umino Nakamichi Seaside Park (which separates the bay from the open sea). The commercial district is located in Nakasu, between the Nakagawa and Hakata Rivers. Hotels and restaurants serving such local specialities as *fugu* (blowfish) and *tori-no-mizutaki* (chicken stew) line the streets. The river banks here bustle with popular street stalls, whichs serve delicious snacks like fried dumplings, Chinese noodles, and barbecued chicken. Tenjin-cho near Nishi Nippon Railroad (generally abbreviated as Nishitetsu) Fukuoka Station makes up the shopping district.

The weather in early June in Fukuoka is normally warm, with an average temperature around 20°C (68°F) and the probability of occasional rain.

Satellite meetings on the following topics are being organized in conjunction with the symposium: 2nd Workshop on Calixarenes and Related Compounds; Chemistry and Biochemistry of Biocatalysis; Metal Complexes in Biochemical Processes; Forum for Young Chemists in Biofunctional Chemistry: Frontiers and the Future in Bioorganic Chemistry; Symposium on DNA and Bioinorganic Chemistry.

Optics and dynamics of polymers
Prague, Czechoslovakia
12–15 July 1993

IUPAC SPONSORED

The 33rd Prague Microsymposium on Macromolecules 'Optics and Dynamics of Polymers' will take place at the Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, Prague, on 12–15 July 1993. It will be held as the 6th meeting of the European Macromolecular Club.

The Microsymposium aims to bring together theoreticians and experimentalists using optical methods in the field of polymer dynamics. All types of macromolecular systems will be considered — dilute, semi-dilute, concentrated solutions and bulk, neutral and charged flexible, semi-flexible and rigid polymers, homogeneous and aggregated systems; surface dynamics of polymeric systems will also be included. Various optical methods yielding dynamic information will be discussed and contributions comparing dynamic optical quantities to those obtained by other physical methods (e.g. mechanical, flow birefringence, ESR) will be appreciated.

The scientific programme will consist of 10 main lectures and 12 special lectures plus contributed papers presented as posters. Summaries of these papers will appear in the *Programme Booklet*. The full texts of the main lectures will be published in a special volume of *Die Makromolekulare Chemie, Macromolecular Symposia*.

The topics of the scientific programme will be:

- Dynamic and flexible, semi-flexible and rigid polymers in dilute, concentrated and bulk systems, with respect to quantities obtainable by dynamic optical methods.
- New results on structure, dynamics and interaction of macromolecular systems obtained by Rayleigh (quasi-elastic) and Brillouin (inelastic) light scattering spectroscopy.

Institute of Macromolecular Chemistry, Prague.

- New methods in quasielastic and in inelastic light scattering spectrosocpy including new concepts of data acquisition and analysis.
- New results obtained on macromolecular systems by related optical methods.

The following scientists have been invited to present main lectures: R. Bansil (University of Boston, USA); W. Brown (University of Uppsala, Sweden); W. Burchard (Albert-Ludwigs-Universität, Freiburg, Germany), P.-G. de Gennes (College de France, Paris, France), T. Hashimoto (Kyoto University, Japan), A. R. Khokhlov (Moscow State University, Russia); T. P. Lodge (University of Minnesota, Minneapolis, USA), L. Monnerie (École Supérieure de Physique et de Chimie Industrielles, Paris, France), P. N. Pusey (Royal Signals and Radar Establishment, Malvern, UK), K. S. Schmitz (University of Missouris, Kansas City, USA).

The registration fee will be approximately CHF 250 for active participants and CHF 110 for accompanying persons. IUPAC affiliates are entitled to a 10% reduction in the full fee. Accommodation will be available in halls of residence within easy reach of the Institute by public transport.

Fluorinated monomers and polymers
Prague, Czechoslovakia
19–22 July 1993

IUPAC SPONSORED

The 34th Microsymposium on Macromolecules: Fluorinated Monomers and Polymers will be held at the Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, Prague, on 19–22 July 1993.

The microsymposium aims to bring together academic and industrial scientists interested in the chemistry and applications of fluorinated monomers and polymers, to provide an opportunity of presenting contemporary research results and to facilitate direct exchange of information usually found in separate meetings.

The main themes of the meeting will be:

- Chemistry of fluorinated monomers (including monomer precursors).
- Chemistry of fluorinated oligomers and polymers.
- Preparation, properties, and applications of fluoropolymers and fluorooligomers.

The programme topics will also include synthesis and chemistry of monomers and potential monomers, analysis of mononomers and polymers, modification of polymer properties by copolymerization, and environmental problems associated with the production of monomers and polymers.

The following scientists have been invited to present main lectures: B. Boutevin (France), D. J. Burton (USA), R. D. Chambers (UK), W. G. Grot (USA), W. Heitz (Germany), W. -Y. Huang (China), G. G. I. Moore (USA), G. Siegemund (Germany), S. V. Sokolov (Russia), C. Wakselman (France) and M. Yamabe (Japan).

Summaries of invited and contributed papers will be published in the *Programme Booklet*. The main lectures will be published in full in a special volume of *Die Makromolekulare Chemie, Macromolecular Symposia*.

The registration fees (which exclude the cost of accommodation) will be about CHF 250 for active participants and CHF 110 for accompanying persons. Affiliates will be entitled to a 10% discount. Accommodation will be available in halls of residence within easy reach of the Institute by public transport.

Harmonization of internal quality assurance schemes
Washington, DC, USA
22–23 July 1993

IUPAC SPONSORED

The 5th International Symposium on the Harmonization of Internal Quality Assurance Schemes for Analytical Laboratories will be held at the National Academy of Sciences, Washington, DC, USA, on 22–23 July 1993. The meeting is being sponsored by IUPAC, the International Organization for Standardization (ISO) and AOAC International (formally the Association for Official Analytical Chemists) and will be held in conjunction with the 107th AOAC International Annual Meeting on 26–29 July 1993. All the lectures and discussions will be conducted in English.

According to the first announcement, at the present time when public opinion is demanding accountability of laboratories carrying out analyses related to socially sensitive issues (drug-testing, blood alcohol monitoring, AIDS-testing, purity of water and air, radioactivity of the environment, acid rain, etc) the importance of harmonizing protocols for quality assurance schemes cannot be overemphasized.

The long-term objective of this symposium is to draft protocols for the development and presentation of quality assurance procedures acceptable to industrial, national and international organizations. A large number of these organizations have alredy expressed interest. A detailed questionnaire has been circulated for the collection of information on

present practice, and the aim of this symposium will be to emphasize common elements and to reduce differences between these.

Dr Roger Wood of the UK Ministry of Agriculture, Fisheries and Food and Dr Michael Thompson of Birkbeck College, University of London, UK, will prepare a discussion document for the symposium together with the members of of the Statistics Sub-Committee of the Royal Society of Chemistry (RSC) Analytical Methods Committee which will be commented on by invited speakers.

A draft protocol will be drawn up after the meeting and will be circulated for further comment. In due course, these comments will be evaluated at a Harmonization Workshop, where a final IUPAC protocol will be prepared. This protocol will also be submitted to the technical committee ISO/TC 47, *Chemistry*, for adoption as an International Standard using the fast-track procedure and for the preparation of AOAC Guidelines.

It is envisaged that the document will cover at least the following topics: What is analytical quality control and analytical quality assurance (in accordance with ISO/TC 176 standards)? Basic principles; Built-in methods for detecting errors in analytical results; Monitoring of performance; Good laboratory practice (GLP) and continuous improvement of performance, the importance of feedback; Comparison — hierarchy of modern analytical methods; Simple, sensible rules to follow; Reference materials as cornerstones for intercomparison schemes (in accordance with ISO Guide 33).

The registration fees for delegates and observers is USD 300 (USD 270 if registering for both the symposium and the 107th AOAC International Annual Meeting). The cost of the proceedings of the symposium will be USD 60.

Risk management of chemicals

The IUPAC-sponsored International Symposium on Risk Management of Chemicals — Can Chemicals Be Used Safely? was held at the University of Surrey, Guildford, UK, on 13–16 July 1992. Those attending included (from left in photo): Prof. P. Butterworth (Senior Pro-Vice Chancellor of Surrey University); Official Representative of the Russian Embassy; Mr M. L. Richardson (Conference Chairman); Dr A. F. Danil de Namor (Official IUPAC Representative); and Prof. Y. I. Kundiev (Ukraine). Richardson's report on the symposium appeared in the previous issue of the magazine (*Chem. Intl.* **15**, 28 (1993)).

Molecular opacities in the stellar environment

IAU (International Astronomical Union) Colloquium 146 on Molecular Opacities in the Stellar Environment will be held at the Niels Bohr Institute and Nordita, Copenhagen, Denmark, 24-29 May 1993. The colloquium is being sponsored by the IAU Commission on Atomic and Molecular Data and co-sponsored by the IAU Commissions on Theory of Stellar Atmospheres, and Stellar Spectra.

For further information please contact: Anne Lumbolt, Nordita, Blegdamsvej 17, DK-2100 Copenhagen, Denmark. email: lumholdt@nordita.dk. Tel: +45 31421616. Fax: +45 31389157.

Chemical kinetics

The 3rd International Conference on Chemical Kinetics: Reactions in Gas and Condensed Media will take place in Gaithersburg, MD, USA, on 12–16 July 1993.

The subject areas include the rates and mechanisms of the gas, liquid, and heterogeneous reactions of: carbon-centered radicals, including carbenes; peroxyl radicals; hydroxyl radicals (and OH addition products); halogen and hydrogen atoms; halogen oxides; nitrate and other nitrogen-containing radicals; sulfur-centered radicals; other radicals, e.g. those containing silicon, phosphorus; metal-containing radicals; ozone and its reaction products.

For further information please contact: Lori Phillips, National Institute of Standards and Technology, Bldg. 101, Room A903, Gaithersburg, MD 20899, USA.

Polymer analysis and characterization

The 6th International Symposium on Polymer Analysis and Characterization will be held on 11–14 July 1993 in Crete, Greece. This 3-day symposium will consist of poster sessions, invited lectures, round-table discussions and information exchange on recent advances in polymer characterization approaches, techniques and applications.

Topics will include chromatography, infrared spectroscopy, NMR, mass spectrometry, chemical characterization, light scattering, rheology, microscopy, viscometry, surface analysis, thermal analysis, thermodynamics and solution properties of polymers, as well as general contributions on polymer analysis and characterization.

Further information and registration forms may be obtained from Judith A. Sjoberg, Professional Association Management, 815 Don Gaspar, Sante Fe, NM 87501, Tel: +1 (505) 989 4735. Fax: +1 (505) 989 1073.

Crystallography

The 16th General Assembly of the International Union of Crystallography (IUCr) and the 16th International Congress of Crystallography will be held at the Beijing International Convention Center on 21–29 August 1993 at the invitation of the Chinese National Committtee for Crystallography and the China Association for Science and Technology (CAST).

The scientific programme will include invited lectures, microsymposia and poster sessions. Most of the contributed papers will be presented in poster sessions. Discussion sessions following poster sessions will be organized in certain cases. Exhibitions of commercial and non-commercial apparatus and of books, as well as crystallographic software and data file demonstrations, will be held in the same hall as the posters.

Accommodation adjoining the Convention Center is available in the Continental Grand Hotel, a four-star hotel. Student accommodation is also available in the vicinity.

For further information please contact: Prof. Xiang-lin Jin, Department of Chemistry, Peking University, Beijing 100871, People's Republic of China.

Modern chemical technology

The 1st International Conference on Modern Chemical Technology (ICMCT' 93) will be held in Qinhuangdao, Hebei, China, on 21–25 August 1993 (immediately after the 34th IUPAC Congress in Beijing).

The scientific programme will focus on the most recent and exciting developments in modern chemical technology and cover the following fields: chemical engineering, petrochemical industry, coal chemical industry, high polymer chemical industry, biochemical industry and new technologies, equipment and materials for the chemical industry.

The conference language will be English. The anticipated registration fee will be USD 290 for full participants, and USD 150 for students and accompanying persons. The fee will include proceedings, reception, banquet, 5 working lunches, one day city tour, and special cultural programmes for accompanying persons.

For further information please contact: Mr Meng Zhaoguang, Secretary of ICMCT' 93, Hebei Chemical Industry & Engineering Society, NO. 6, Xiangyi Road, Chengxiang Street, 050061 Shijiazhuang, Hebei, China. Tel: +86 (311) 744715. Fax: +86 (311) 632457. Telex: 26078 ASSTH CN.

Carbohydrates

The 7th European Carbohydrate Symposium (EUROCARBON VII) will be held in Cracow, Poland, on 22–27 August 1993, under the auspices of the European Carbohydrate Organization and the sponsorship of the Federation of European Chemical Societies (FECS).

The scientific programme will include plenary and section lectures, selected oral presentations and poster sessions on the following themes: (a) synthesis in the carbohydrate field; (b) structure, conformational aspects, and spectroscopy of carbohydrates; (c) biochemistry of carbohydrates and (d) industrial carbohydrates. All lectures, communications and other information will be in English.

For further information please write to: Dr S. Jarosz, EUROCARB VII, Institute of Organic Chemistry, Polish Academy of Sciences, ul. Kasprzaka 44/52, 01-224 Warsaw, Poland.

Conference Calendar

Conference circulars and registrations forms for the IUPAC-sponsored conferences listed below may be obtained, upon request, from the names and addresses shown in italics.

1993

Characterization of porous solids

9–12 May.
3rd International Symposium on Characterization of Porous Solids (COP-111). Marseille, France.
Prof. J. Rouquerol, Centre de Thermodynamique et de Microcalorimetrie du CNRS, 26 rue du 141 ème RIA, 13003 Marseille, France.

Environment and analysis

11–13 May.
International Environment 93 and Analysis 93.
London, UK.
Mr M. L. Richardson, BASIC, 6 Birch Drive, Maple Cross, Rickmansworth, Hertfordshire WD3 2UL, UK.

Safety in chemical production

31 May–4 June.
2nd IUPAC Workshop on Safety in Chemical Production.
Yokohama, Japan.
Prof. K. Tamaru, Japan IUPAC Workshop Committee, c/o The Chemical Society of Japan, 1-5 Kanda-Surugadai, Chiyoda-ku, Tokyo 101, Japan. Tel: +81 (3) 3292-6161. Fax: +81 (3) 3292-6318. Telex: 02226198 CSJ J.

Bioorganic chemistry

6–10 June.
2nd International Symposium on Bioorganic Chemistry.
Fukuoaka, Japan.
Symposium Secretariat, 2nd International Symposium on Bioorganic Chemistry, Department of Chemical Science and Technology, Faculty of Engineering, Kyushu University 36, Higashi-ku, Fukuoka 812, Japan. Fax: +81 (92) 6321842.

Carotenoids

20–25 June.
10th International Symposium on Carotenoids.
Trondheim, Norway.

10 Carotenoid Symposium, SEVU Conference Office, N-7034 Trondheim, Norway. Tel: +47 (7) 59 52 46 Fax: +47 (7) 51 72 26.

Multiphoton processes

24–30 June.
6th International Conference on Multiphoton Processes (ICOMP VI).
Québec, Canada.
Dr S. L. Chin, Faculté des Sciences et de Génie, Centre d'optique, photonique et laser, Université Laval, Paveillon Alexandre-Vachon, Cité universitaire, Québec, Canada GiK 7P4. Tel: 1 (418) 656-2454.

Macrocyclic chemistry

27 June – 2 July
18th International Symposium on Macrocyclic Chemistry.
Enschede, Netherlands.
Dr J. F. J. Engbersen, Department of Chemical Technology, University of Twente, P.O. Box 217, 7500 AE Enschede, The Netherlands. Tel: +31 (53) 892926. Fax: +31 (53) 356024.

Spectroscopy

29 June – 4 July
18th Colloquium Spectroscopicum Internationale.
York, UK.
XXVIII Colloquium Spectroscopicum Internationale, Department of Chemistry (CSI Secretariat), Loughborough University of Technology, Loughborough, Leicestershire, LE11 3TU.

Cationic polymerization

4–7 July
11th International Symposium on Cationic Polymerization and Related Ionic Processes.
Borovets, Bulgaria.
Dr I. V. Berlinova, Institute of Polymers, Bulgarian Academy of Sciences, 1113 Sofia, Bulgaria. Tel: +359 (2) 700138/7133663. Fax: +359 (2) 707523. Telex: 22729 echban bg.

Boron chemistry

11–15 July
8th International Meeting on Boron Chemistry (IMEBORON VIII), Tennessee, USA.
IMEBORON VIII, University of Tennessee Conference Center, PO Box 2468, Knoxville, TN 37901-2648, USA. Tel: +1 (615) 9740250. Fax: +1 (615) 9740268.

Optics and dynamics of polymers

12–15 July
33rd Microsymposium on Macromolecules, Optics and Dynamics of Polymers.
Prague, Czechoslovakia.
33rd Microsymposium, P.M.M. Secretariat, c/o Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, 162 06 Prague 6, Czechoslovakia. Tel: +42 (2) 360317. Fax: +42 (2) 367981. Telex: 122019 IMCP C.

The 18th Colloquium Spectroscopicum Internationale will be held in York, UK.

Fluorinated monomers and polymers

19–22 July
34th Microsymposium on Macromolecules, Fluorinated Monomers and Polymers.
Prague, Czechoslovakia.
34th Microsymposium, P.M.M. Secretariat, c/o Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, 162-06 Prague 6, Czechoslovakia. Tel: +42 (2) 360317. Fax: +42 (2) 367981. Telex: 122019 IMCP C.

Harmonization of internal quality assurance schemes

26–29 July
5th International Symposium on the Harmonization of Internal Quality Assurance Schemes for Analytical Laboratories.
Washington, DC, USA.
Dr Michael Parkany, ISO Central Secretariat, Case postale 56, CH-1211 Genève 20, Switzerland.

Heterocyclic chemistry

1–6 August
14th International Congress on Heterocyclic Chemistry.
Antwerp, Belgium.
Prof. F. C. Alderweireldt, Antwerp University, Groenenborgeriaan 171, B-2020 Antwerp, Belgium.

IUPAC General Assembly

5–12 August
37th IUPAC General Assembly.
Lisbon, Portugal.
The IUPAC General Assembly is not open for general participation but restricted to members of IUPAC bodies that meet on this occasion.

Mössbauer effect

8–14 August
International Conference on the Applications of the Mössbauer Effect.
Vancouver, Canada.
Prof. J. G. Stevens, Mössbauer Effect Data Center, University of North Carolina at Asheville, One University Heights, Asheville, NC 28804, USA.

IUPAC Congress

15–20 August
34th IUPAC Congress.
Beijing, China.
Prof. Xinqi Song, Secretary General of 34th IUPAC Congress, c/o Chinese Chemical Society, PO Box 2709, Beijing 100080, China.
Tel: +86 (1) 2568157 or 2564020. Telex: 20035 CAST CN c/o CAST.

Organosilicon chemistry

15–20 August
10th International Symposium on Organosilicon Chemistry.
Poznan, Poland.
Xth International Symposium on Organosilicon Chemistry, Prof. B. Marciniec, Chairman of the Organizing Committee, Faculty of Chemistry, Adam Mickiewicz University, Grunwaldzka 6, 60-780 Poznan, Poland.

Solution chemistry

15–21 August
23rd International Conference on Solution Chemistry.
Leicester, UK.
Dr M. J. Blandamer, Department of Chemistry, Leicester University, University Road, Leicester, LE1 7RH, UK.

Plasma chemistry

22–27 August
11th International Symposium on Plasma Chemistry.
Loughborough, Leicestershire, UK.
ISPC 11, Loughborough University, Loughborough, Leicestershire, LE11 3TU, UK. Tel: +44 (509) 224172. Fax: +44 (509) 222854.

Macromolecule–metal complexes

30 August – 3 September
5th International Symposium on Macromolecule-Metal Complexes.
Bremen, Germany.
Prof. D. Wöhrle, Institute of Organic & Macromolecular Chemistry, University of Bremen, Leobener Str. NW 11, W-2800 Bremen 33, Germany.

Euroanalysis VIII

5–11 September
Euroanalysis VIII — European Conference on Analytical Chemistry.
Edinburgh, UK.
Miss P. E. Hutchinson, Analytical Division, Royal Society of Chemistry, Burlington House, Piccadilly, London W1V OBN, UK. Tel: +44 (71) 437 8656. Fax: +44 (71) 734 1227. Telex: 268001.

Advanced polymer materials

6–10 September
International Conference on Advanced Polymer Materials.
Dresden, Germany.
Technische Universität Dresden, Dezernat 5, Zentrales Tagungsbüro, Mommsenstraße 13, Dresden, O-8027, Germany.

Organometallic chemistry

19–23 September
7th International Symposium on Organometallic Chemistry Directed Toward Organic Synthesis (OMCOS-7).
Kobe, Japan.
Prof. Shun-Ichi Murahashi, Department of Chemistry, Faculty of Engineering Science, Osaka University, Machikaneyama, Toyonaka, Osaka 560, Japan.

1994

Natural products chemistry

16–20 January
19th International Symposium on Natural Products Chemistry.
Karachi, Pakistan.
Prof. Atta-ur-Rahman, Chairman, Organizing Committee, H.E.J. Research Institute of Chemistry, University of Karachi, Karachi-75270, Pakistan. Tel: +92 (21) 470007 or 476131. Fax: +92 (21) 467887 or 466896. Telex: 28095 HEJRI PK. E-Mail: atta%hejfirst@unet.uu.net.

High-temperature materials chemistry

5–8 April
8th High Temperature Materials Conference (HTMC VIII).
Vienna, Austria.
Prof. K. L. Komarek, Institut für Anorganische Chemie der Universität Wien, Währingerstraße 42, A-1090 Wien, Austria.
Tel: +43 (222) 345 424, Fax: +43 (222) 310 4597.

Pesticide chemistry

4–9 July
8th Interntional Congress of Pesticide Chemistry.
Washington, DC, USA.
Dr J. R. Plimmer, ABC Laboratories, 7200 ABC Lane, PO Box 1097, Columbia, MO 65205, USA.

Macromolecules

11–15 July
35th International Symposium on Macromolecules.
Ohio, USA.
Macroakron'94, Cathy Manus-Gray, Symposium Coordinator, Institute of Polymer Science, The University of Akron, Akron, OH 44325-3909, USA.

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IUPAC sponsorship implies that entry visas will be granted to all bona fide chemists provided application is made not less than three months in advance. If a visa is not granted one month before the meeting the IUPAC Secretariat should be notified without delay by the applicant.

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The International Union of Pure and Applied Chemistry (IUPAC), formed in 1919, is a voluntary non-governmental, non-profit association of organizations, each of which represents the chemists of a member country.

Its objectives are:

- to promote continuing co-operation among the chemists of the member countries;
- to study topics of international importance to pure and applied chemistry which need regulation, standardization, or codification;
- to co-operate with other international organizations which deal with topics of a chemical nature;
- to contribute to the advancement of pure and applied chemistry in all its aspects.

The membership of IUPAC presently comprises 41 countries, each represented by a national organization, such as an academy of science or research council.

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Front cover: One of the old laboratories of the Chemistry Department, Faculty of Sciences of the University of Lisbon.

International Union of Pure and Applied Chemistry

Medicinal chemistry

Topics in the IUPAC monograph *Medicinal Chemistry for the 21st Century* include: strategies for the creation of new drugs; protein structure–function relationships; pharmacophore studies; and bioavailability manipulations.

Introduction

Medicinal Chemistry for the 21st Century is one of the latest IUPAC monographs in the series devoted to 'Chemistry for the 21st Century'. The volume was edited by Camille G. Wermuth (President of the IUPAC Section on Medicinal Chemistry, 1987–91) with N. Koga(Secretary), H. König and B. W. Metcalf (Vice President).

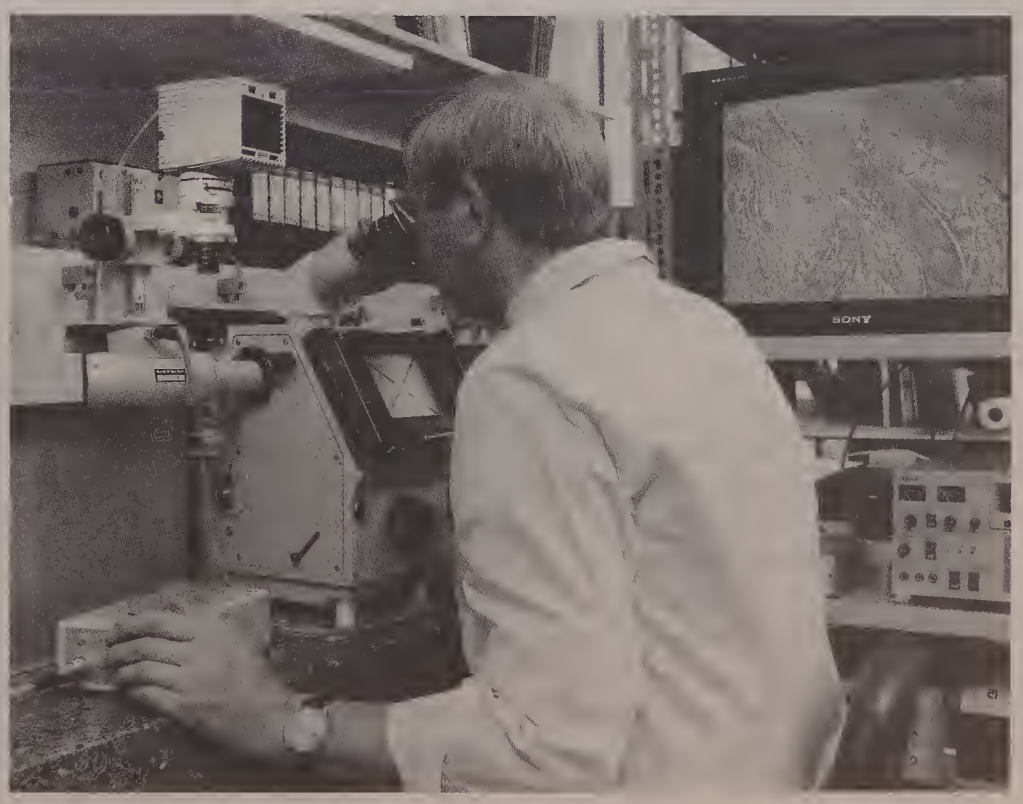
In the preface to the book, Wermuth and Nobel Laureate Derek H. R. Barton write that during the 34th IUPAC General Assembly in 1987, their colleague Kirill Zamaraev suggested that it would be beneficial for all the scientific divisions or sections represented within IUPAC to assemble their respective knowledge and edit a series of monographs devoted to the various aspects and prospects of chemistry at the dawn of the 21st century. This ambitious enterprise was accepted with enthusiasm and the idea of publishing a series of specialized monographs, under the generic name 'Chemistry for the 21st Century', was considered to be an important opportunity to increase the influence, recognition and accomplishments of the IUPAC divisions and sections.

In this context, the IUPAC Section on Medicinal Chemistry decided to contribute in sponsoring and editing the present volume.

Hesitating between the title 'Medicinal Chemistry – Future Directions' and 'Medicinal Chemistry for the 21st Century', the second title was finally adopted. The selection of topics and authors gave rise to many passionate discussions relating to the design and development of new chemical molecules for the treatment, cure or prevention of human and animal diseases. However, it was rapidly recognized that three critical stages essentially govern the obtaining of valuable new drugs: (i) the identification and production of an original active principle (lead compound; (ii) the improvement of the lead compound in terms of potency, selectivity and safety; and (iii) the suitability of the molecule selected for clinical use, primarily that it reaches its target organ. In addition, one must render its administration acceptable to patients and doctors.

In the first stage, the real problem lies in the discovery or identification of an original line of research, since there is no laid-down formula and no means of planning a laboratory's creative work. As a result, the discovery of new lead compounds represents the most uncertain stage in the development programme of a drug. The first part of the book, therefore, illustrates the quest for active substances. Traditional approaches to the generation of new lead compounds that should remain valid, are presented. Rational strategies, based on a complete knowledge of biochemical and physiopathological disturbances, are also described.

Protein structure–function relationships constitute the second part of the book. Great advances in the knowledge of enzyme and receptor interactions with smaller molecules have helped to explain the mechanisms of biological effects. Signal transduction will be an absolute requisite for the medicinal chemist dealing with drug design during the next few decades.



Strategies for the creation of new drugs and protein structure–function relationships are two of the themes of the IUPAC monograph on medicinal chemistry. (*Photo courtesy Hoechst AG.*)

The third part of the book constitutes the more classical structure–activity relationships in medicinal chemistry. In this field, benefits can be expected from two major advances in supramolecular chemistry: (i) computer-aided drug design, allowing modelling and quantifying of drug-receptor interactions; and (ii) design of peptidomimetics, in other words, nonpeptide surrogates acting on receptors for peptidic ligands. In any event, from leads provided by these methods, medicinal chemists can quickly develop more active and, at the same time, more selective and less toxic molecules.

The final part of the book is devoted to chemical formulation and to specific administration devices in order to obtain optimal bioavailability of active molecules and thus to render them chemically efficient. As Moliere once wrote: *La façon de donner vaut mieux que ce que l'on donne*.

Camille Wermuth.

Medicinal Chemistry for the 21st Century *is edited by C. G. Wermuth and published by Blackwell Scientific Publications, Oxford, UK, 1992. xii + 402 pp. ISBN 0-632-03408-4. Price: GBP 69.50/USD 110.00. Affiliate Members discount price GBP 41.70/USD 66.00.*

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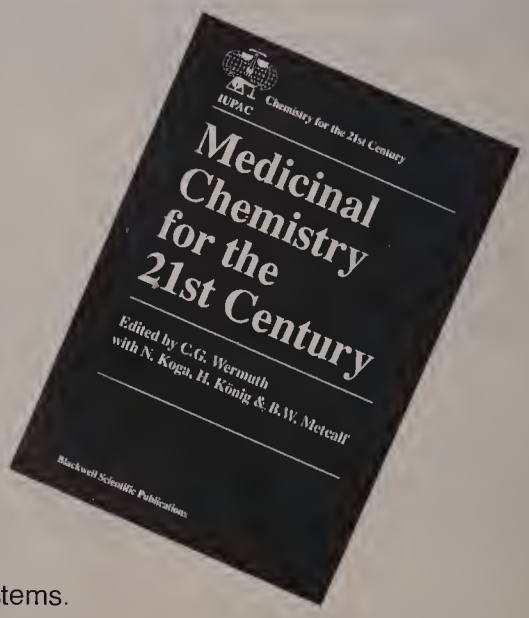
CHEMISTRY FOR THE 21st CENTURY

IUPAC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Medicinal Chemistry for the 21st Century
Edited by C.G. Wermuth with N. Kogan, H. König & B.W. Metcalf
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Adverse effects of pesticides on nontarget organisms

SCOPE Report 49 addresses the problems which pesticides may pose to nontarget organisms – humans, animals, plants, microorganisms – and to ecosytems.

SCOPE Report 49 is the result of the 7th project of SGOMSEC, the Scientific Group on Methodologies for the Safety Evaluation of Chemicals, which operates under the general sponsorship of the International Programme on Chemical Safety (IPCS) and the Scientific Committee on Problems of the Environment (SCOPE) of the International Union of Scientific Unions (ICSU). The objective of SGOMSEC is to examine and review critically methods for the evaluation of the adverse predictive effects of industrial and environmental chemicals on human health and on non-human forms of life.

The volume includes a number of contributed papers plus a joint report expressing the consensus reached after a workshop held on 3–7 October 1988 in Ceské Budejovice, Czechoslovakia. Substantial extracts from Chapter 1 'Introduction, General Conclusions, and Recommendations' are reprinted below with the kind permission of SCOPE.

Introduction

For purposes of this discussion, a pesticide is any compound or formulation used to control pests which contains active ingredients and other substances (e.g. solvents, emulsifiers, buffers) to aid its delivery to target organisms and hence minimize pests. The major types of pesticides are herbicides, fungicides, rodenticides, molluscicides, soil bacteriostats, disinfectants, and living organisms with pesticidal activity. In practice, mixtures of pesticides rather than single agents are often applied; this practice can lead to synergism or potentiation resulting from interaction between pesticides or among the ingredients of a formulation.

Through the careful use of pesticides, humans have benefited considerably by having an increased abundance of assorted foods. In some places, pesticides have assisted in assuring a continued supply of nutriment to the local population. An estimated 5 million tons of pesticides have been applied to world agriculture. Yet, pests around the globe still destroy about 35% of all potential crops before harvest, indicating that the use of pesticides has been only marginally successful at improving agricultural productivity.

Most of the 5–10 million species of natural biota are essential for a quality environment and the survival of mankind.

People cannot survive with only their plants and livestock. Natural biota in the ecosystem number 5–10 million species in the world and 500 000 in the United States alone. Most of these natural species are essential for a quality environment and the survival of humankind. Natural biota perform a diversity of essential tasks including: decomposition of wastes, recycling nutrients, maintenance of biological diversity, stabilization of soil and water resources, continuation of energy flow in natural ecosystems, pollination of crops and natural vegetation, and stabilization of climatic conditions.

Despite their value to agriculture, pesticides have also in some circumstances posed direct and indirect threats to the health of humans and to the environment around the world. Workers, because of ignorance or neglect, have been injured – even killed – by pesticides as a result of improper mixing, loading, and application techniques. At times, those consuming pesticide-tainted foods have been over-exposed, even to the point of illness. In other circumstances, pesticides – agents generated to destroy unwanted organisms – have destroyed beneficial organisms in the delicate web of nature, leading in some instances to changes in the human environment that reduce, rather than promote, human well-being. These beneficial species are the nontarget organisms (NTO) which are the subject of this report.

The occurrence of such unwanted side-events is of sufficient magnitude to warrant attention from scientists and public officials alike to improve the safety in the manufacture, use, and disposal of pesticidal substances. This volume is dedicated to that objective. In Chapter 2, the ways by which humans come into contact with pesticides are addressed, as are the scientific procedures by which human exposures can be documented to determine later whether injury to people and their environment has been, or is likely to be, manifest. Chapter 3 is devoted to an analysis of the intricacies associated with documenting injuries to humans exposed either only one time or repeatedly for the major part of a lifetime. Chapter 4 pays comparable attention to diverse approaches that measure injurious changes at various locations of ecosystems and upon which people depend inextricably for growth and development of a global civilization. Chapter 5 provides an overview of integrated pest management, a complex practice that makes more efficient use of pesticides and reduces the likelihood of over-exposure of humans and other nontarget organisms.

Presented below is the consensus view of a global representation as to the major conclusions and recommendations associated with the impacts of pesticides on nontarget organisms.

It has been estimated that less than 0.1% of the pesticides applied to crops reach the target pests.

General conclusions

Pesticide use

1 Approximately 1000 pesticide formulations are in use throughout the world today for virtually all forms of agricultural commodity. The annual worldwide agricultural use of pesticides has been estimated to be of the order of $5 \psi 10^6$ tons with a value of about USD16.3 billion.

2 Despite the use of pesticides, about 35% of crops have been estimated to be lost. Nearly 50% of food in the world may be lost annually despite all pest control procedures. It has been estimated that less than 0.1% of the pesticides applied to crops reach the target pests; thus, more than 99% of applied pesticides have the potential to impact NTOs and to become widely dispersed in the environment.

3 Delineating toxic effects of the use of any pesticide is complicated by the existence of some 5–10 million species in the environment, most of which are potential unintended targets of the toxicity of pesticides.

4 Approximately 5 million tons of pesticides (perhaps 70% herbicides and only 5% insecticides) are applied annually in the world, of which about 70% is used for agriculture, and the remainder by public health agencies and government agencies for vector control and by home owners. Agriculture and forestry, which occupy *c.* 70% of the land area in some countries, are the primary source of pesticides in ecosystems.

Injuries to human and nonhuman NTOs

1 In developing countries, acute pesticide poisoning is a major public health problem, because it is so frequent (i.e. more than 1 million cases annually in the 1980s). Classically, acute toxicity has been restricted to morbidity and mortality in those individuals exposed directly; recently, that definition has been enlarged to include injury to developing fetuses.

2 Although not yet well documented, pesticide-induced chronic toxicity is emerging as a public health concern of major proportions. The toxic manifestations that capture the greatest attention include cancer, reproductive impairment, and irreversible neurotoxicity.

3 Acute and chronic injury to nontarget organisms other than humans has been pronounced over the past few decades. The most affected organisms have included fish and birds; and the most prevalent mechanisms of such damage have been depression of reproduction of beneficial organisms and stimulation of reproduction of natural enemies.

4 The extent of ecosystem damage is illustrated by the observations that invertebrate NTOs are often killed by pesticides used against insects and acarine target pests; foliar applications of broad spectrum insecticides produce nearly total depletion of arthropod populations in crops such as cotton; microorganisms are most susceptible to fungicides and bactericides aimed at target plant pathogens in the field.

5 The measurement of adverse consequences in ecosystems is extremely difficult because of the biological complexity of the biosphere. Consequently, considerable resources need to be directed to efficient and reliable methods to identify early effects that may propagate injury throughout the ecological web.

Controlling exposures to pesticides

1 Damage caused to NTOs from the use of virtually all forms of pesticides is large and needs to be reduced appreciably in developing and developed countries. The costs of such unwanted injuries are enormous.

2 Reductions in exposures to pesticides used for agriculture and in the home are possible through education about the proper use of pesticides, the use of application techniques that reduce the environment dissemination of aerosols, liquids, and powders, and the appropriate use of protective equipment.

3 Limitations on the overall use of pesticides is not only desirable but also achievable through the diverse approaches offered by integrated pest management.

In developing countries, acute pesticide poisoning is a major public health problem. (*Photo: UNESCO; D. Roger.*)

4 The use of techniques developed for recombinant DNA in the biological control of plant pathogens is currently a promising area of research in both academic and industrial institutions. The application of molecular genetics to selected biocontrol systems can potentially provide an understanding of the genes involved in biological control phenomena; an establishment of a genetic basis involved in biological control is a prerequisite to further molecular studies that centre on the enhancement of biological control phenomena.

General recommendations

Controlling exposure to pesticides

1 As a prerequisite, the development of either new pesticides or new uses of existing pesticides should include means for exposure control proportional to the hazard potential of the chemical. This effort should consider physical form, prepackaged quantities for direct use in the field, closed transfer systems, and application procedures that deposit the pesticide primarily on a specific target.

2 The success of procedures for pesticide exposure control depends on a proper understanding and motivation of individuals using these substances. Rudimentary education is needed to impart general principles to prevent exposure; these fundamentals can be presented through visual and textual aids and in the language and social style of the populace. The recent initiative under the aegis of the Food and Agriculture Organization (FAO) is an example of this approach.

3 High priority should be given to developing pesticides with increased selectivity toward pest species and greatly reduced damage to nontarget species. Furthermore, pesticide management should increasingly prevent the development of resistance in pest, because this phenomenon impairs selectivity.

4 State-of-the-art technologies to apply pesticides are designed to reduce the potential for human exposure. The best available and most cost-effective technologies should be applied to reduce the occurrence of acute poisoning, and new technologies should be encouraged to continue reduction of exposures.

Assessing exposures to pesticides and uncertainties

1 An international agency, such as the United Nations Environmental Program (UNEP) or the Organization of Economic and Community Development (OECD), should conduct a workshop aimed at developing environmental sampling guidelines for monitoring studies. Participants should include regulatory officials, modellers, epidemiologists, and chemists.

2 Improved methods are necessary on an international scale to provide developing nations with the capability to screen dietary exposures and identify sources of potential hazard in the diet.

3 Serious attention must be given to the effects of pesticide exposures on subgroups, such as infants and children, who are known to be exposed to relatively higher doses of pesticides through dietary and household exposures.

Laboratory analysis of milk. (*WHO photo by P. Larsen.*)

Assessing acute toxicity for humans

1 To characterize the problem of acute pesticide poisoning, conventional public health practices must be monitored. Recognizing that there are geographic, population, climatic, and agricultural differences around the world that influence patterns of pesticide usage, the best approach to study acute pesticide poisoning is from the 'bottom up', i.e. beginning at the local level with support from state and national levels.

2 Many immunotoxicity procedures have been developed for classes of chemicals other than pesticides. These techniques need to be adapted to examine the response of the immune system to pesticides. Because of evidence of autoimmuno responses in humans after exposure to pesticides, reliable animal models are needed to detect and quantify such effects in a manner predictive of human responses. Newer biochemical techniques need to be incorporated into the investigation of pesticidal effects on the immune response.

3 While technologies for measuring the effect of chemicals on immunosuppression and immunosensitization exist, they have yet to be validated or used to examine the effects on the immune system of acute exposures to pesticides. Measuring functional impairment of the immune system should be part of the evaluation of pesticide toxicity.

4 Tests of acute toxicity in major organs such as the lungs (except for the paraquat effect), blood and blood-forming tissues, the cardiovascular system, kidney, endocrine organs, and musculoskeletal system need to be part of test batteries.

5 Adequate techniques are unavailable to determine in skin cellular proliferation, the presence of biomarkers, and allergic reactions; hence, research is needed into the numerous functions of the skin.

Assessing chronic toxicity for humans

1 For the spectrum of pesticides, reproductive and developmental toxicity should be assessed in animals and humans.

2 The current assessment of developmental toxicity focuses primarily on structural rather than functional endpoints. Methods are needed to assess the effect of *in-utero* exposure on the functional development of organ systems in addition to the nervous system.

3 Reproductive toxicity screens should be expanded beyond tests in rodents used to evaluate fertility. Specific methods must be enhanced to detect effects on spermatogenesis and oogenesis to help identify site(s) of action of reproductive toxicants and to distinguish primary (i.e. direct effect) from secondary (i.e. due to other toxicity) reproductive toxicants.

4 Animal models are needed to evaluate the effect of pesticides on lactation – both on its quality and as a source of exposure of neonates to chemicals in the milk. Human milk is an extremely important source of nutrition worldwide, and is probably the most critical source of exposure to neonates, a highly vulnerable age-group.

5 Further development and validation of *in-vitro* tests for developmental toxicity is strongly recommended. Test systems that provide useful mechanistic data would potentially improve our understanding of those mechanisms by which developmental toxicity is caused in animals and humans.

6 Improved reliability is needed for short-term *in-vitro* and *in-vivo* qualitative and quantitative tests for promoters of cancer.

7 Reliable short-term *in-vivo* qualitative and quantitative genotoxicity tests are needed to detect and quantify oncogenes and anti-oncogenes; for *in-vitro* genotoxicity tests, research should focus on quantitation of cancer potency.

8 The current scientific basis should be greatly enhanced to extrapolate carcinogenic responses from laboratory animals to humans and to extrapolate effects at high doses to those at low doses.

9 Additional epidemiological studies are required of pesticide-exposed populations to establish the presence or absence of cancer induction.

10 Biological markers of carcinogen exposure and effect need to be improved, particularly to detect changes that occur early in the latent period.

11 Public health should be promoted by implementing appropriate monitoring and epidemiologic surveillance, initially to identify improved control measures.

12 In developing countries, local pesticide control boards should be established with representation of all interested parties having authority to implement and supervise the policies and regulations established by national regulatory agencies.

Assessing damage to ecosystems

1 The ecological consequences of pesticide use must be evaluated from the level of a single species to that of multiple species and finally to the level of the ecosystem. Many methods are available to test for susceptibility of NTOs, and some tests are already required for pesticide registration. The effects of pesticides on ecosystem structure and function should be measured in the agroecosystem of interest for a pesticide. Decisions on surveillance of the broadest ecosystem should be based on the hazard of each pesticide.

2 Microcosm studies cannot be relied upon solely to determine complex ecosystem responses to pesticides; however, microcosm methods are appropriate, and are recommended for general information on the relative persistence, bioaccumulation, and ecological kinetics of pesticides in model organisms.

The effects of pesticides on ecosystem structure and function should be measured in the agro-ecosystem of interest for a pesticide.

3 Studies of soil subsystems are recommended, because direct and indirect complex processes are caused by pesticide treatments and their residues. Changes in the community structures of soil biota are reflected by altered biological and chemical processes, as well as by their rates of change. These changes could be measured in microcosms (e.g. leaching of nutrients of humic substances) and, albeit less easily, in the field by changed ecosystem parameters such as diversity, CO_2 production, and decomposition rate.

4 The development and application of genetically engineered pesticidal organisms require research to evaluate ecological risks, if any, posed by such organisms. Risks should be evaluated on the bases of (a) ecosystem effects, (b) fate and survival of population, (c) intraspecies and interspecies gene transfer, (d) contaminant and mitigation, (e) transport and dispersal, and (f) detection and enumeration.

5 Natural ecosystems must be investigated and protected from pesticide damage, because they play an essential role in maintaining a quality environment for humans, agriculture, and forestry.

6 A distinct need exists for a widely accepted procedure to assess ecological effects of pesticides on NTO species in terrestrial and aquatic ecosystems. From the myriad of possibilities that could comprise ecosystem effects, certain factors should receive priority and are amenable to research using biogeochemical cycling, trophic structures, decomposition rates, and transport into non-target environments.

Integrated pest management

1 To alleviate public and scientific concern, prior to the approved release of engineering microorganisms into the environment, the efficacy and safety of biological control agents should be fully evaluated, and the risks and benefits carefully assessed.

2 To implement biological control programs based on the biotechnology of IPM, the following must be improved: (a) understanding of total ecosystems, (b) mass production and delivery of control agents, (c) selection and enhancement of control agents, and (d) the specificity of control agents to only one disease on one crop in a small geographic area.

The Portuguese Chemical Society

Racquel Gonçalves

The 37th IUPAC General Assembly, which takes place in Lisbon in August, is being hosted by the Portuguese Chemical Society (SPQ) and the Department of Chemistry, Faculty of Sciences of the University of Lisbon. Raquel Gonçalves, who is an Associate Professor in the Department, describes the history, organization and activities of SPQ.

History

The Sociedade Portuguesa de Química – SPQ (Portuguese Chemical Society) was founded in January 1912, but changed its designation to the Portuguese Physical and Chemical Society 12 years later.

Its foundation was closely related to the publication of *Revista de Química Pura e Aplicada* (*Journal of Pure and Applied Chemistry*), which was first published in Oporto in 1905. This initiative was taken by a small group of Portuguese scientists, among whom Ferreira da Silva was the most prominent of all. Ferreira was also the first President of the Society.

In February 1974 , the Portuguese Physical and Chemical Society split into the Portuguese Chemical Society and the Portuguese Physical Society. However, it was not until 3 years later that the two new societies established themselves in their respective head-offices on the 4th floor of 37 Avenida da República in Lisbon.

The inauguration ceremony of SPQ took place on 24 February 1977 in the presence of the Secretary of State for Scientific Research, the Rectors of the Universities of Lisbon and the Presidents of the National Institute of Scientific Research, the National Board of Scientific and Technological Research and the Calouste Gulbenkian Foundation.

The main aims of the Society were emphasized during the ceremony: 'The Society should be constituted as a centre of progress, light, cordiality and debate so as to stimulate and promote dialogue amongst scientists in order to develop research and more efficient methods of teaching chemistry'.

SPQ publishes two periodicals, both of which are distributed free to members: *Revista Portuguesa de Química* (*Portuguese Journal of Chemistry*) and *Boletim SPQ* (*SPQ Bulletin*).

Professors Sebastião J. Formosinho and José Artur Martinho Simões (left) are respectively SPQ President and General-Secretary.

The old Faculty of Science of the University of Lisbon.

Organization

SPQ has its head-office in Lisbon. There are five Delegations: in Aveiro, Braga, Coimbra, Lisbon and Porto. In addition there are several Local Sections in chemistry departments of universities, schools and other institutions scattered throughout the country.

The Society is governed by a General Assembly, a Directive Council, an Executive Committee and a Council of Auditors.

The General Assembly of members is the highest deliberating body of the Society and it meets at least once a year. Its several functions include the election of the Board of the General Assembly: President, First-Secretary, Second-Secretary, the Directive Council and the Council of Auditors.

The Directive Council of the Society consists of the President, Vice-President, General-Secretary, two Assistant General-Secretaries, a Treasurer and the Presidents of all five Delegations. The Executive Committee, on the other hand, includes the General Secretary, two Assistant General Secretaries and the Treasurer. The Committee handles matters concerning membership, Delegations and Local Sections as well as all the relations with government offices and other national and foreign scientific and technical associations. The Council of Auditors consists of a President, Secretary and Reporter.

From the scientific point of view, the Society is organized into various Divisions: Organic Chemistry, Inorganic Chemistry, Physical Chemistry, Analytical Chemistry, Catalysis, Chemistry and Industry, and Education. There are also Groups devoted to the following specializations: Mass-Spectrometry, Chemistry and Computers, Free Radicals and Food Chemistry.

SPQ membership is open to anyone interested in chemistry and offers five categories of membership: honorary membership; benefactors; collective membership; effective membership and student membership. Honorary membership is bestowed by SPQ on national and foreign scientists of distinction in their respective fields. Benefactors may be individual or collective. They contribute to the progress of the Society and its aims. Companies, institutions and schools may become collective members according to the statutes.

The admission of collective, effective and student members is determined by the Directive Council of the Society. Proposals must be subscribed by two effective members.

Raquel Gonçalves.

SPQ activities

SPQ currently organizes an annual meeting. However, this frequency is expected to change to biennial meetings in the future with smaller, more specific meetings held by Divisions and Groups in between. During the annual meetings, national and foreign experts in chemistry from universities, high schools, industry and state laboratories have the opportunity of exchanging information about the results of their recent investigations and of becoming acquainted with various topics of current interest.

Although SPQ does not have a specific scientific programme, much of its activity focuses on the support given to highschool teachers of chemistry. In particular, a databank containing information about Portuguese chemistry books has been developed. SPQ also promotes interaction between academic and industrial chemists.

In 1981, SPQ instituted a biennial award in order to pay homage to a Portuguese master chemist who distinguished himself through his many scientific contributions in previous years and was founder of the Portuguese Chemical Society. This was The Ferreira da Silva Prize.

SPQ is a member of various international organizations concerned with chemistry. The most important of these are IUPAC and the Federation of European Chemical Societies (FECS). In 1992, 17 Portuguese chemists were members of IUPAC bodies. There were also 13 IUPAC affiliates in Portugal last year.

Publications

The *Portuguese Journal of Chemistry*, was first published in 1905. Until 1958 it was known as the *Journal of Pure and Applied Chemistry*,

The purpose of this journal, as Ferreira used to say, was 'to publish articles on scientific explorations, either theoretical or experimental'. It was open to all experts in chemistry. Its publication, although seriously interrupted at times, has continued until this day. The lack of regularity of its publication and the low public acceptance has led to SPQ considering a change in its aims, structure and content.

The *SPQ Bulletin*, which is published quarterly, contains up-to-date information on new chemical products, national and international activities (including congresses and conferences) and short articles on education, technological developments and current research. In recent years, some issues have concentrated on specific subjects, for example: Chemistry and Industry (1985); Polymers (1986); Chemistry and Art (1987); Chemistry and the Environment (1989), Chemistry and Health (1990) and Chemistry and Education (1991).

SPQ Bulletin is published in Portuguese and contributes significantly to dialogue between chemical societies in Portuguese and Spanish speaking countries.

SPQ has not only been concerned with the publication of periodicals but also with the publication of books - particularly those dealing with the interaction of chemistry and other disciplines. The two volumes of *Chemistry and Society* published in 1990 and 1992 are examples.

The Society also hopes to collaborate with Sociedade Brasileira de Química – SBQ (Brazilian Chemical Society) in the translation of IUPAC Nomenclature Recommendations into Portuguese.

The address of SPQ is: Sociedade Portuguesa de Química, Avenida da República, 37-4º, 1000 Lisboa, Portugal. Tel: +351 (1) 793 46 37.

SPQ head-office at 37 Avenida da República, Lisbon.

Chinese Chemical Society and IUPAC

Xibai Qiu and Wenrong Xu

The 34th IUPAC Congress to be held in Beijing in August is one of many examples of cooperation between the Chinese Chemical Society and IUPAC dating back to 1979.

Beijing Congress

Organization of the 34th IUPAC Congress, which will take place in Beijing, on 15–20 August 1993 (see *Chem. Intl.* **15**, 70, 1993), has been a major activity of the Chinese Chemical Society (CCS) over the last year or so. Many eminent scientists in the world, including Nobel Laureates Jean-Marie Lehn and John Polanyi, have agreed to attend the Congress and present lectures.

CCS has managed to obtain support for the Congress from the State Science and Technology Commission of China, Chinese Academy of Sciences, China Association for Science and Technology, National Natural Science Foundation, State Education Commission of China, Ministry of Chemical Industry, Sino-Petro Chemical Cooperation and Beijing Municipal.

Beijing University.

Many Chinese chemists are active in IUPAC

The Chinese Chemical Society, which represents the chemical community in China, joined IUPAC in 1979 as a National Adhering Organization. Since then, 36 chemists have been elected as Bureau, Titular and Coopted Members of IUPAC and four chemists have acted as Observers on the IUPAC Committee on Chemistry and Industry (COCI).

There are currently 31 Chinese chemists involved at various levels on IUPAC bodies. For example, Prof. T. L. Chang was active on Commission on Atomic Weights and Isotopic Abudances (II.1) in the revision of atomic weights and Prof. D. S. Yan is currently a Titular Member of the Commission on High Temperature and Solid State Chemistry (II.3).

CCS has also been instrumental in promoting and operating the IUPAC Affiliate Membership Programme in China. At present over 50 Chinese chemists are IUPAC affiliates.

Workshop on Safety Assessment in Chemistry, Jilin, 1991.

IUPAC-sponsored conferences

Several IUPAC-sponsored conferences, workshops and other meetings have been held in China over the past decade. For example:

- International Symposium on Organic Chemistry of Medicinal Natural Products (Shanghai, 1985)
- 25th International Conference on Coordination Chemistry (Nanjing, 1987)
- Pesticide Chemistry Workshop (Tianjin, 1988)
- International Conference on Chemical Thermodynamics and Calorimetry (Beijing, 1989)
- International Symposium on Olefin and Vinyl Polymerization and Functionalization – Reactions, Mechanisms and Industrial Applications (Hangzhou, 1991)
- 6th Annual Meeting of the East Asia Sub-Group of the Working Party on Structure and Properties of Commercial Polymers (IV.2.1.1) – Commission on Polymer Characterization and Properties (Beijing, 1991)
- Workshop on Safety Assessment in Chemical Industry (Jilin, 1991).

Nearly 2000 chemists from China and overseas countries have attended these meetings. Professor S. Nagakura, a Past-President of IUPAC attended the 50th anniversary of CCS as a representative of IUPAC in 1982. Other visitors have included IUPAC Vice-President Prof. Heinz Staab and IUPAC Executive Secretary Dr Mo Williams who gave a report on IUPAC to the Institute of Chemistry.

1991

1991 was a good year for cooperation between CCS and IUPAC. For example, the COCI-sponsored Workshop on Safety Assessment in Chemical Indusry was held at the Jilin Chemical Industry Co, Jilin. Experts such as Prof. I. L. Reh, Dr F. Schmaiz and Mrs S. Cox described advanced techniques in safety management in the chemical industry to their Chinese colleagues.

Professor Heinz Staab (fourth from right) meets officers of the Chinese Chemical Society.

Their lectures covered many of the major problems in safety management such as: safe process conditions; hazard identificaton; safety awareness training; hazard assessment and reduction; management of human factors; safety education and information dissemination.

Chinese experts, Profs Jinzhong Zhang, Guogeng Liu and Yuangen Li also gave lectures on systems safety engineering and safety assessment. More than 100 Chinese experts attended the Workshop. At the request of Prof. Reh, CCS Deputy-Executive Secretary Dr Xibai Qui introduced IUPAC and COCI to participants.

As a result of the efforts of Prof. Reh and CCS, two Chinese Chemical Companies will become Company Associates of IUPAC. These are the Shanghai Petrochemical Complex and the Shanghai Research Institute of Petrochemical Industry. CCS hopes that this will provide an incentive for further cooperation between IUPAC and Chinese chemical industry.

In October 1991, Prof. Heinz Staab, Vice-President of IUPAC, visited Beijing and met CCS officers including Prof. Aoqing Tang (Executive President); Prof. Yadong Hu (President); Prof. Fu Xi (Secretary General) and Prof. Xinqi Song (Deputy Secretary-General). After careful consideration they decided that the 34th IUPAC Congress should take place at the Beijing International Convention Centre.

In the meantime, the IUPAC-sponsored International Symposium on Olefin and Vinyl Polymerization and Functionalization was held in Hangzhou. Over 150 scientists from Australia, Canada, China, Germany, the Netherlands, Japan, Norway, the Republic of Korea, Singapore, Sweden, and the USSR attended the symposium. Prof. Walter Heitz, President of the IUPAC Macromolecular Division presented greetings at the Opening Ceremony.

The symposium included the following plenary lectures:

- The role of amines in vinyl polymerization (Prof. Xinde Feng)
- Advances in Zieglar–Natta polymerization – unique polyolefin copolymers, alloys and blends made directly in the reactor (Prof. P. Gall)
- Surface modification of polymers by photoinitiated graft polymerization (Prof. B. Ranby).

At the end of the symposium, a successful Workshop on the Importance of Polymer Synthesis in the Future of the Polymer World was held under the presidency of Prof. Heitz.

The 6th Annual Meeting of IUPAC Working Party IV.2.1.1 was held on 8 October 1991 in Beijing Grand Hotel. 19 scientists from China, Japan and the Republic of Korea participated at the meeting. Prof. Akio Nakajima, Kyoto University, presided over the meeting while Prof. Renyuan Qian, an Associate Member of the IUPAC Commission on Polymer Characterization and Properties (Macromolecular Division) presented the welcoming address.

As a final example of CCS–IUPAC cooperation in 1991, the IUPAC-sponsored International Conference on Applications of the Mossbauer Effect was held in Nanjing.

For further information on CCS activities please contact: Mr Xibai Qiu, Deputy Executive Secretary, Chinese Chemical Society, PO Box 2709, Beijing 100080, China. Tel: +86 (1) 2568157/2564020. Fax: +86 (1) 2568157.

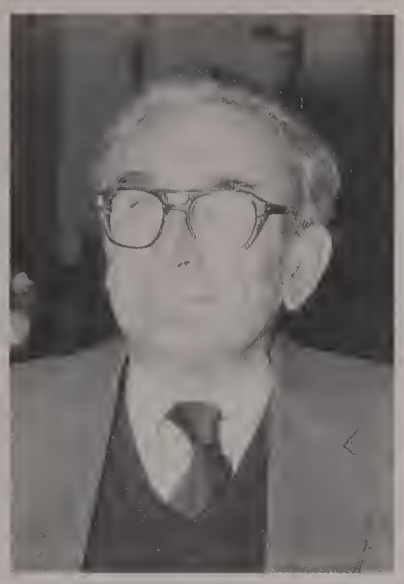
Canada proposes Statute changes in 1993

Hugh Rowlinson, Chairman of the Canadian National Committee for IUPAC, outlines the background and reasoning behind proposed changes to the IUPAC Statutes.

The National Adhering Organization for IUPAC in Canada is the National Research Council (NRC), located in Ottawa, Ontario. NRC has recently submitted to the Bureau some changes to the IUPAC Statutes, which it is expected will be discussed and voted upon at the Council meeting in Lisbon in August 1993. The purpose of this article is to give delegates some of the background and reasoning behind the proposed changes, and to promote discussion of them by IUPAC-concerned people in all countries, before the Council meeting.

At the Hamburg Council in 1991, whenever IUPAC organization was discussed, two themes seemed to dominate. These were the difficulty being experienced in 'restructuring' the Union, and the present and expected shortage of money. 'Restructuring' is used here in the rather specialized sense of starting Commissions, possibly joint and/or of limited life, to look at problems in science likely to arise in the future, while at the same time speeding up, or discontinuing, those whose remit was either nearly complete or becoming outdated. It does not mean a major restructuring of how IUPAC goes about its scientific business.

Hugh Rowlinson



Following some discussions with other countries at Hamburg, the Canadian delegation proposed to the Canadian National Committee for IUPAC (CNC) in December 1991 some changes in the IUPAC statutes which could be helpful. These are given in Annex 1. They were discussed with Canadian Titular Members of IUPAC Commissions, and following unanimous support by CNC, the NRC also approved them and has submitted them to the Bureau.

The proposed Statute changes will have the effect, if approved, of requiring the Division and Section Presidents, in their reports to the Bureau, and after considerable consultation with the Commissions, to rank their Commissions in order of priority. Subsequently, when under By-law B4.302, the Bureau submits the biennial program to Council, a similar list of ranked Commissions would be required. Clearly the great bulk of Commissions would be approved by Council without discussion, as is the case at present. Only those Commissions where there is doubt as to how to proceed, either for budgetary reasons or because of disagreement in the Bureau, need Council make a decision. This should be quite a small number; it is not proposed that Council redo all the work of the Bureau.

The main reason for proposing these Statute changes at this time is that they should encourage a business-like way of managing a complex organization in times of budgetary stringency. They should help ensure that the core work of the Union gets properly funded, and that new activities will be properly weighed against the less urgent of those now in hand. But there are difficulties; a number of these came out in discussions with Canadian Titular Members, although the great majority of these supported the proposals enthusiastically. Some difficulties are:

1 It is not possible to rank Commissions in the manner proposed, or Presidents and Chairmen, even with the most sincere efforts, will only be able to rank them all equal. This cannot be accepted. Many scientists have to rank projects as part of their daily work, and all do so implicitly by deciding 'what do I work on this morning?' It may be difficult, but in no sense of the word is it impossible.

2 The decisions will be too 'top down', not reflecting the views of those who work on the Commissions, and from whom project proposals should arise. The proposal that Presidents should consult with Commission Chairmen is intended to avoid this, by going to the level where the best information is.

3 The proposals conflict with other initiatives of the Executive to solve the same problems. This is not believed to be so. The proposals are at least complementary, at best supportive of other initiatives. Moreover, experience from other fields suggests that ranking is a more effective means of achieving what is needed than some alternatives, such as project guidelines or criteria. To be mildly cynical, projects can always be designed to meet criteria, but ranking is for real!

4 The proposed system would be unfair to a Division with three Commissions, as against one with twenty three. This would certainly require care by the Bureau, but we are not proposing a rigid or mechanical system. Judgement will always be needed.

In conclusion, it is believed that these proposed Statute changes will be a real help in good decision-making for the future of the Union. Although difficult, they may even assist the Presidents in their admittedly onerous role in directing IUPAC's scientific work. It is requested that all country's delegations discuss the proposals, and preferably be prepared to vote in favour at the August 1993 Council meeting.

Annex 1 Proposed changes to the IUPAC Statutes and By-Laws. **NB** Proposed changes are indicated in bold.

Existing		Proposed
Statute S7.42	The principal duties of the Bureau, subject always to the Statutes and By-laws, are to prepare the agenda for meetings of the Council and, in particular, to make provision for elections;	The principal duties of the Bureau, subject always to the Statutes and By-laws, are to prepare the agenda for the meetings of the Council and, in particular, **to provide a priority ranking list of Commissions for each Division and Section**, and to make provision for elections.
By-Law B4.302	Commissions At each General Assembly, the Council shall in the light of the Division or Section President's report and on the recommendation of the Bureau decide whether or not to continue each Commission.	Commissions At each General Assembly, the Council shall in the light of the Division or Section President's report, **which shall include a priority ranking list of all its Commissions**, and on the recommendation of the Bureau decide whether or not to continue each Commission.

Letter to the Editor

Chemistry of the Amazon

The Brazilian Chemical Association wishes to locate scientists willing to participate in an International Symposium on Chemistry of the Amazon to be held in Manaus, Am, Brazil, on 19–23 September 1993.

Sir,

The Amazon region represents a large part of South America. It harbors the world's most extensive system of tropical rain forests and probably shelters more than half of all the species presently know to be living on our planet.

Chemistry plays an important role in preserving the Amazon's fauna and flora. It provides a basis for the investigation of natural phenomena related to competition among species, their spatial propagation and their response to external factors, generating the knowledge required for correct management of natural ecosystems. It also serves to reveal valuable substances and materials which, if exploited rationally, could provide local populations with an adequate standard of living for many generations.

Extensive research has been carried out on the geochemistry, hydrochemistry, environmental chemistry and chemistry of natural products of the Amazon region. However, most of these studies were carried out in laboratories far from where the samples originate and results rarely find their way back to those in a position to contribute to the preservation and/or rational development of the region.

In fact, our Association has just held a national meeting on 'Chemistry of the Amazon'. An analysis of topics such as renewable resources, the chemistry–biology interface, industry and pollution as well as the development of research and teaching in chemistry served to confirm how rich and diverse the region's biomass really is. The fact that economic activities are contributing to decimate this valuable resource instead of taking advantage of its potentialities is a clear indication of the high degree of ignorance about the region and what it has to offer.

We are presently trying to locate groups that have investigated the geochemistry, hydrochemistry, environmental chemistry and chemistry of natural products of the Amazon, We intend to invite them together with specialists on chemical processes that determine biodiversity to take part in an international symposium dedicated to putting together and comparing as much information as possible on chemistry of the Amazon and to examine alternatives for development of the region with the least interference possible in the natural processes that occur in the ecosystem. It will be held in Manaus, Am, Brazil, on 19–23 September 1993.

If you are aware of the work of colleagues who would be willing to participate in the symposium send us a brief description of their research or ask them to write directly to:

International Symposium on Chemistry of the Amazon,
Associação Brasileira de Química,
Rua Alcindo Guanabara,
24/16° andar, 20031-130,
Rio de Janeiro, RJ,
Brazil.
Tel. +55 (21) 262-1837; fax +55 (21) 262-6044

We are very grateful for your assistance.

Peter Rudolf Seidl
President of the Brazilian Chemical Association

Secretary General's Column

Gerrit den Boef

Secretary General Gerrit den Boef reports on the 1992 Bureau meeting and other recent IUPAC activities.

A most fortunate development, during the Bureau meeting held at Lady Margeret Hall, Oxford, UK, in September 1992, was the unanimous agreement achieved on the matter of restructuring the scientific work of the Union. Officers and other Bureau Members, including all Division Presidents, felt very much relieved that, after so many time-consuming discussions over the past few years, this result could be obtained.

As a matter of fact, the Council still has to express its view at the forthcoming General Assembly in Lisbon. Moreover, the agreement has to be implemented in practice, but so far everybody feels satisfied. I do not wish to go into detail after what I wrote in the November 1992 issue of *CI*. I shall therefore restrict myself to only a few points.

The most difficult aspect has always been the discussion on Commission structure. It was agreed that all Limited Lifetime Commissions (LLTCs) will cease to exist as such in Lisbon this summer, and that the Titular Membership of these bodies (amounting to 18 persons) will form a pool to be used for special purposes. Divisions/Section can apply for memberships from this pool, preferably for a limited amount of time. The allocations will be made at the meeting of the Executive Committee in April, so that such activities can start immediately after the Lisbon General Assembly.

Furthermore, Division/Section Presidents will obtain freedom in the division of the total Titular Membership of their permanent Commissions and Division/Section Committee so that Commissions with a limited task may have fewer

Titular Members than others with an extensive programme. The same flexibility is proposed for the Divisional/Sectional budget. Under the same conditions, Divisions/Section may propose the creation of new Commissions subject of course, as stated in the statutes, to approval by the Council.

It is to be expected that this flexibility will enable the Divisions/Section to improve their scientific performance.

One of the problems chemistry has faced for a long time is its bad public image. This reflects even onto our position in interdisciplinary scientific organizations: recently, I mentioned the low profile of chemistry in the International Council of Scientific Unions (ICSU) and there are other examples.

We were therefore very pleased with a meeting we recently had with Dr V. Zharov, Director of Basic Sciences at UNESCO, on possible further cooperation in the near future. Main concerns within UNESCO are the environment and the needs of developing couintries. We agreed to consider the possibility of organizing a joint UNESCO–IUPAC conference on the question 'What can chemistry as a basic science do for developing countries?' Various topics emerged during the discussion:

1 Environment chemistry – for which we have an extensive programme.

2 Safety in chemical production; for developing countries this might take the form of some UNESCO–IUPAC fellowships, with the Committee on Chemistry and Industry (COCI) and the IUPAC Company Associates collaborating.

The 1992 IUPAC Bureau meeting was held at Lady Margaret Hall, Oxford.

3 Education at various levels.

Such a meeting might very well fit into our series of CHEMRAWN (Chemical Research Applied to World Needs) Conferences. Both COCI and the CHEMRAWN Committee are therefore represented by their Chairmen in these discussions with Dr Zharov.

The COCI initiative of organizing a number of meetings under the title 'Chemistry for life' is beginning to crystallize. These meetings are intended to highlight the fact that, in 1994, it will be 75 years ago since IUPAC was founded. This initiatve will no doubt contribute to improving the image of chemistry.

PAC review

Pure and Applied Chemistry (*PAC*) is IUPAC's official journal. It publishes the main invited lectures of symposia sponsored by the Union; the recommendations of its Commissions on nomenclature, symbols and units, and technical reports on standardization, recommended procedures, collaborative studies and data compilations. Summaries of the most recent IUPAC recommendations on nomenclature and symbols, and technical reports appearing in *PAC* are published in *Chem. Intl.* in the section Recent Reports. In this section we take a brief look at the symposia and lectures published in recent issues of *PAC*.

Jean-Clauder Richer was conference editor of ICOS-92. Plenary and invited lectures were published in the December 1992 issue of *Pure Appl. Chem.*

Organic synthesis in Montréal

Sixteen plenary and invited lectures presented at the 9th International Conference on Organic Synthesis (ICOS-92) held in Montréal, Canada, on 28 June – 2 July 1992 were published in the December 1992 issue of *Pure Appl. Chem.*

The conference editor was Jean-Claude Richer (Université de Montréal, Canada) who is a member of the Organic Chemistry Division Committee.

Two reports on this conference have already appeared in *Chemistry International* [see *Chem. Intl.* **15**, 11–13 and 59–60 (1992)]

The December issue also included three IUPAC Technical Reports (see Recent Reports).

Novel aromatic compounds

The January 1993 issue of *Pure Appl. Chem.* contains 20 plenary lectures presented at the 7th International Symposium on Novel Aromatic Compounds held in Victoria, BC, Canada, on 19–24 July 1992.

The published lectures include 'Benzenoid catafusenes: Perfect matchings, isomerization, automerization' by Alexandru T. Balaban (Polytechnic Institute, Bucharest, Roumania); 'Iptycenes, cuppedophanes and cappedophanes' by Harold Hart (Michigan State University, USA) and 'Cyanoalkynes: Magic wands for the preparation of novel aromatic compounds' by Henning Hopf and Bernhard Witulski (Technical University Braunschweig, Germany).

Fullerenes

IUPAC affiliate Robert C. Haddon (AT&T Bell Laboratories, USA) presented a lecture on 'Electronic structure, conductivity and superconductivity of alkali metal doped C_{60}'. In the abstract to the published paper, Haddon writes that the curvature and topology required for fullerene formation strongly enhances the electronegativity of the carbon clusters and as a result C_{60} readily accepts electrons.

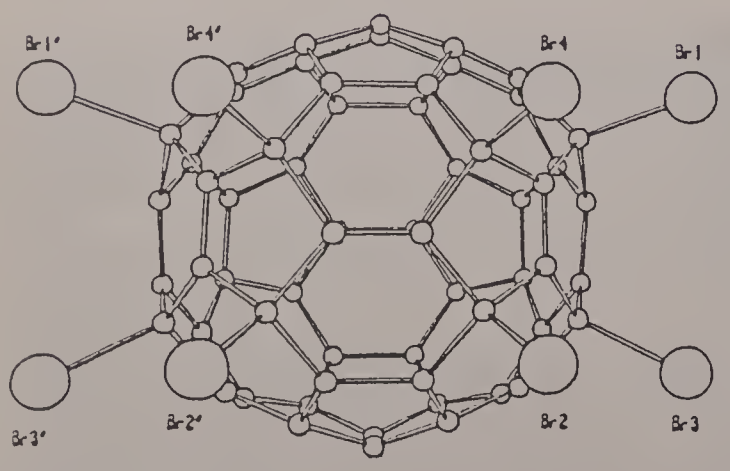
He adds that solid C_{60} undergoes doping with alkali metal vapours to produce intercalation compounds which are conductors. During the doping process the predominant phases are; C_{60}, A_3C_{60} and A_6C_{60}. The A_3C_{60} compounds are formed from C_{60} by occupancy of the interstitial sites of the fcc lattice. These phases constitute the first three-dimensional organic conductors and for A = K, Rb, the A_3C_{60} compounds are superconductors.

Roger Taylor also delivered a lecture on fullerenes. The title of the paper was 'Isolation, characterization, and chemical reactions of fullerenes'. The paper was co-authored by Taylor and 12 other chemists in the UK: 9 from the University of Sussex (including Harry Kroto); 2 from Leicester University and 1 from Southampton University.

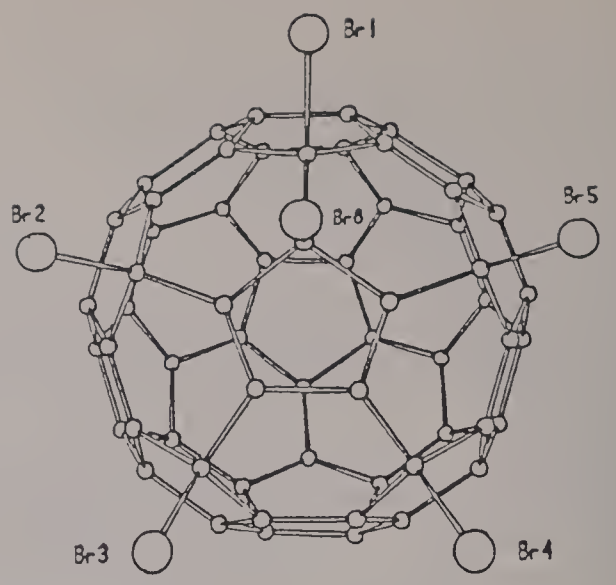
In the published paper, the authors report that the extension of the chromatographic work that led to the first isolation of pure C_{60} and C_{70} has resulted in the isolation and characterization of C_{76} and three isomers of C_{78}. Comparison with other work indicates the composition ratio of C_{78} to be dependent upon the method of carbon production.

Halogenation of C_{60} gives derivatives that have been characterized either by NMR, or by single crystal X-ray diffraction. The halogeneo-derivatives readily undergo nucleophilic substitution, which provides a route to the formation of many fullerene compounds, but precludes use of the fluoro-derivatives as lubricants. In the presence of Friedel–Crafts catalysts, the bromo-derivatives substitute into aromatics to give aryl derivatives of C_{60} especially those containing either 6, 8, 12 or 16 aryl groups per C_{60} molecule. The authors compare possible structures for these with those for addition products which have only low eclipsed steric interactions.

Two other plenary lectures on fullerenes were also presented at ISNA-7 although these were not published in the January issue of *Pure Appl. Chem.*: 'C_{60} and the emerging carbon-based nanotechnology' (R. E. Smalley, Rice University, Texas, USA) and 'Recent advances in the chemistry of buckminsterfullerene' (F. Wudl, University of California, Santa Barbara, USA).



Structure of $C_{60}Br_8$

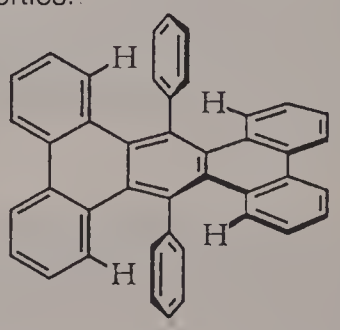


Structure of $C_{60}Br_6$

Tormented

Some of the symposium lectures had intriguing titles. For example, we have already met the terms: 'perfect matchings' and 'magic wands' in the titles of lectures mentioned above. The title of a lecture by Robert A. Pascal, Jr (Princeton University, USA) may also be considered to fall into this category: 'Tormented aromatic compounds'. The lecture described the chemistry of compounds containing aromatic rings which have been twisted, prodded, or bent.

Pascal reported that for several years his team at Princeton has pursued the synthesis, and structural and spectroscopic characterization, of highly strained organic molecules in which a variety of relatively unreactive functional groups are forced closely together. Their working hypothesis has been that the enforced proximity of these functional groups, often much closer than the sum of their van der Waals radii, should enhance their mutual reactivity, and that by balancing intramolecular strain with functional group reactivity, they might discover molecules with unusual bonding arrangements and unusual spectroscopic and physical properties.



The first tormented aromatic compound investigated by Pascal was 9,18-diphenyltetrabenz[*a,c,h,j*]anthracene.

The extremely close contact of a hydrogen atom or other functional group with the π-system of an aromatic ring is an important feature of many of the compounds discussed in Pascal's paper. He reports that a variety of chemical consequences, arising from purely steric interactions or from more subtle electronic perturbations, have been observed in these systems.

Recent Reports

In this section we publish summaries of the most recent IUPAC recommendations on nomenclature and symbols and technical reports. The full texts of these recommendations and reports are published in *PAC*.

Quantities and units for metabolic processes as a function of time (IUPAC Recommendations 1992)

The aim of this document is: (i) to analyse the elements of the specifications for time-related quantities in the clinical laboratory; and (ii) to recommend a format that will unify, simplify, clarify and hence improve the reporting and understanding of time-related quantities measured in the clinical laboratory.

This report was prepared for publication by G. Férard, Commission on Quantities and Units in Clinical Chemistry, IUPAC Clinical Chemistry Division, and Committee on Quantities and Units, Scientific Division, International Federation of Clinical Chemistry, and published in Pure Appl. Chem. ***64****, 1569–1575 (1992).*

Characterization of the cure of resins by differential scanning calorimetry (Technical Report)

The cure of resins has long been characterized by using DSC to measure a 'heat of reaction' (ΔH). Unfortunately, although useful as a quality control parameter, ΔH is rarely equal to the thermodynamic heat of reaction. As a result, derived data such as the extent and rate of reaction are in error and subsequent predictions of the kinetic behaviour may be seriously flawed.

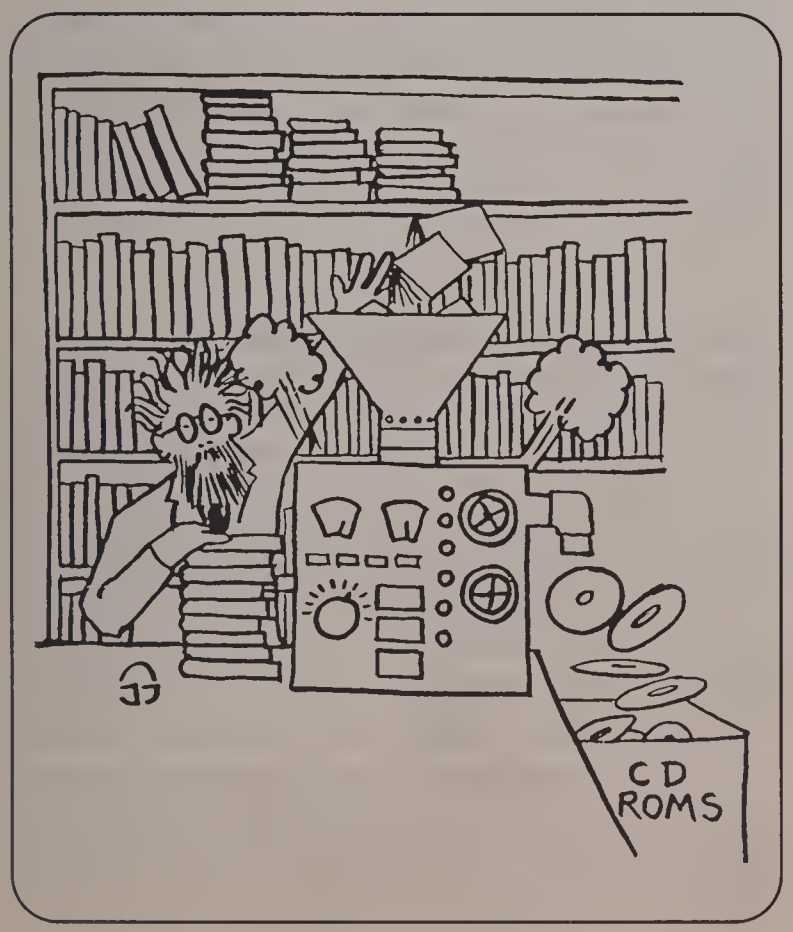
This collaborative programme was devised to investigate the magnitude of the problem using a well-behaved system to obtain conventional data. These were combined with heat capacities of reactants and products to show how errors arise with a variety of baselines. Emphasis is placed on the need for correct physical foundations before the cure kinetics of a particular system can be considered.

This report was prepared for publication by M. J. Richardson, Working Party on Thermal Properties of Polymers, Commission on Polymer Characterization and Properties, Macromolecular Division, and published in Pure Appl. Chem, ***64****, 1789–1800 (1992).*

Intrinsic characterization of continuous fibre thermoplastic composites-II. Pseudo-elastic constants for aromatic polymer composite (APC-2) (Technical Report)

Tensile characteristics, stiffness and ultimate strength of laminates of different constructions, namely uniaxial, cross- and angle-plied, are measured and compared with the theoretical values generated by means of the micro- and macromechanical modelling. Stiffness characteristics, including the engineering constants of the CF/PEEK lamina, have been found to be predictable from first principles, i.e. from the properties of the constituting materials and their relative concentrations. The ultimate strength can be derived providing that the laminate response is linear and elastic. This is not the case for angle-plied laminates where ply-reorientation complicates the prediction.

This report was prepared for publication by A Cervenka, D. R. Moore and J. C. Seferis, Working Party on Structures and Properties of Commercial Polymers, Commission on Polymer Characterization and Properties, Macromolecular Division, and published in Pure Appl. Chem. ***64****, 1801–1808 (1992).*



We asked *Chemistry International* cartoonist Steve Johnston to depict the compression of the longest index in the world, consisting of over 100 volumes, into a few CD-ROMs. This is what he came up with. Two weeks later, IUPAC affiliate W. Val Metanomski sent us the photograph on page 103 to illustrate his news item.

Aging effects in 16 years on mechanical properties of commercial polymers (Technical Report)

Experimental results are presented on the static mechanical properties of six kinds of thermoplastics stored for 16 years under standard conditions (20°C, 65% RH) and at some constant temperatures ranging from −20°C to 40°C. Changes in the tensile strengths (yield strength and breaking strength at small strain) at 20°C storage temperature are less than 1% for PMMA, POM, ABS and PE, and nearly 7% for PS and PVC. Changes in the compressive yield strength at 20°C storage temperature are 4–6% for PMMA, PS, ABS and PE, 11% for PVC, and 20% for POM. Changes in the flexural yield strength at 20°C storage temperature are less than 2% for PMMA and POM, 5–6% for PVC, ABS and PE, and −8% for PS. Changes in the modulus of elasticity in flexure are 3–5% for PMMA, PS, POM and PE, and 6–7% for ABS and PVC. Higher storage temperature results in a large effect on strength changes for PVC, ABS and POM; it seems that the storage temperature of 40°C excites an unusually strong influence on the strength. Some discussions are made on the enhancement of yield strength.

This report was prepared for publication by H. Kondon, T. Tanaka, T. Matsuda, A. Nakajima, Working Party on Structure and Properties of Commercial Polymers, Commission on Polymer Characterization and Properties, Macromolecular Division, and published in Pure Appl. Chem, ***64****, 1945–1958 (1992).*

An assessment of lipid oxidation in foods (Technical Report)

Lipid oxidation has been long recognized as a major problem in the storage of fatty foods. Oxidative changes can result in repugnant flavors, in destruction of valuable nutrients and even in generation of toxic compounds. This reaction occurs by several molecular mechanisms which all channel to generation of oxygen-rich precursors of reactive, chain-propagating, free radicals. The complexity of the chemistry involved defies the possibility of one, universal, analytical test for unconditional evaluation of the oxidation deterioration. However, the better understanding of lipid oxidation achieved in the recent years should assist in answering the questions of importance in food systems.

This report was prepared for publication by J. Kanner and I. Rosenthal, Commission on Food Chemistry, and Commission on Oils, Fats and Derivatives, Applied Chemistry Division, and published in Pure Appl. Chem, ***64****, 1959–1964 (1992).*

Pesticides report 29: appraisal of the fate of agrochemicals in plants and soil – a cost-effective integrated approach (Technical Report)

Radiolabelled confined field studies performed with formulated test materials at the recommended use rates and timing can be designed to generate integrated data on soil/plant metabolism, soil dissipation and bioavailability of soil residues to rotational crops. They offer the possibility to investigate the fate of the degradates in each compartment at an early stage of the development program. Due to the quantitative nature of the results they represent an adequate source of field residue data to detect a 'negligible total residue situation' in raw agricultural commodities which eliminates the need for lengthy development of specific analytical residue methods on delegates. As a consequence they represent a substantial rationalization of the overall environmental testing program.

The 29th IUPAC Report on Pesticides deals with the appraisal of the fate of agrochemicals in plants and soil. (*Photo: UNESCO, D. Roger.*)

This report was prepared for publication by B. Donzel and E. Dorn, Commission on Agrohemicals, Applied Chemistry Division, and published in Pure Appl. Chem, ***64****, 1965–1972 (1993).*

Analytical methods for post-irradiation dosimetry of foods (Technical Report)

The trade and acceptance of foods treated with ionizing radiation, gamma radiation or X-rays; require appropriate means of control. A foolproof test to detect whether or not food has been irradiated, and eventually to quantify the amount of radiation, is vital to verify the labelling and enforce legislation. Such an assay also provides the information for avoiding repeated irradiations which are likely to degrade the food in terms of organoleptic acceptability and nutritional quality.

This report was prepared for publication by I. Rosenthal, Commission on Food Chemistry, Applied Chemistry Division, and published in Pure Appl. Chem, ***65****, 165–172 (1993).*

Provisional Recommendations

IUPAC seeks your comments

In this section we publish synopses of IUPAC's latest provisional recommendations on nomenclature and symbols. All comments on these recommendations are welcome and will be taken into consideration. The final revised versions are published in *Pure and Applied Chemistry* and synopses of these are published in *Chem. Intl.* as recent reports.

If you would like to comment on the provisional recommendations please write to your nearest national/regional centre requesting a copy of the full report. Copies are not available from the IUPAC Secretariat. The most up-to-date list of the national/regional centres appeared in *Chem. Intl.* **14**, 25 (1992).

Nomenclature for radioanalytical chemistry

In 1982, IUPAC issued a 'Glossary of terms used in nuclear analytical chemistry' (*Pure Appl. Chem.* **54**, 1533–1554, ,1982) listing nearly 400 terms of interest in nuclear analysis. In the present compilation, a number of definitions from the 1982 glossary have been repeated. However, less emphasis has been placed on terms from the realm of nuclear technology, nuclear physics and radioactivity measurements. For such terms the earlier glossary should be consulted.

In the present work, many new terms have been included which are relevant in radiometric analysis, in radioimmunoassay and related techniques. As far as possible, these definitions have been taken from existing compilations by organizations active in the field of clinical chemistry, sometimes with minor modifications, while, in cases for which no acceptable definition could be found, a new definition is proposed.

The choice of the terms has mostly been based on practical experience. The compilers selected those terms that were either ambiguous or confusing, or which are not obvious or clear to beginning workers in radioanalytical chemistry.

The present glossary is directed to chemists who exploit radioactivity, in any way, for quantitative analysis, and to those working in clinical chemistry, biochemistry, nuclear medicine and related disciplines.

Comments on the document are welcome and should be sent by 30 September 1993 to: Dr C. Graham, Department of Chemistry, University of Birmingham, PO Box 363, Birmingham B15 2TT, UK.

Nomenclature of inorganic branched chain and polycyclic compounds

A systematic, additive approach to name inorganic chain and monocyclic compounds has recently been introduced. In this document the method is extended by use of the general nodal descriptor to chain compounds containing more complicated branched structures, to polycyclic compounds, and to mixed chain-and-ring compounds. The use of the method is intended for inorganic compounds that are mainly composed of atoms other than carbon.

Nodal nomenclature is based on the description of the structure of the molecule in terms of its graph. At the most general level, nodal nomenclature does not specify the nature of bonding between the atoms. Thus, it is not necessary to assume any specific ligancy for any atom. Therefore, nodal principles can conveniently be applied for the coordination nomenclature commo in inorganic chemistry.

In the case of neutral branched chain frameworks the compound is called 'catena' preceded by a multiplicative prefix 'di-', 'tri-', etc., to indicate the number of branches in the molecule. Likewise polycyclic compounds are called 'cycle' preceded by the appropriate multipicative prefix. A mixed chain-and-ring compound is named as 'catenacycle'. In the case of charged species the names are modified by the suffices '-ium' and '-ate'. The connectivity in the framework is indicated by a nodal descriptor which is placed in square brackets immediately before the terms 'catena', 'cycle' or 'catenacycle'.

The atoms are numbered according to the general nodal nomenclature regardless of their chemical identity. Only in the case of ambiguity is the chemical nature of the atoms taken into consideration.

The atoms forming the nodal skeleton are listed in alphabetical order complete with their locants and are named by modifying the element radical names in table V of *Nomenclature of Inorganic Chemistry* by substituting '-y' for the terminal '-io'. Atoms and groups of atoms which are not a part of the nodal framework are named as ligands and are cited in alphabetical order together with their locants before the cited sequence of the atoms constituting the nodal framework.

Comments on the document are welcome and should be sent by 30 September 1993 to: Prof. R. S. Laitinen, Department of Chemistry, University of Oulu, Linnanmaa, SF-90570 Oulu, Finland.

Basic terminology of stereochemistry

When the Commission on the Nomenclature of Organic Chemistry prepared Section E: Stereochemistry (*Pure Appl. Chem.* **45**, 11–30, 1970) the document was primarily intended to describe the naming of stereochemical features of organic molecules. However, in the absence of any IUPAC recommendations on stereochemical terminology many necessary terms were defined in the document. Such terms were then excluded from the Glossary of Terms used in Physical Organic Chemistry (*Pure Appl. Chem.* **55**, 1281–1371, 1983) prepared by the Commission on Physical Organic Chemistry. It became apparent that a separate glossary of stereochemical terminology was needed so a joint

working party was set up by the Commissions with representation also from the Commission on the Nomenclature in Inorganic Chemistry and the Commission on the Nomenclature of Macromolecular Chemistry.

The terms selected were those considered essential for the work of the Commissions and any other which were widely used of misused. In the latter case as well as condemnation of inappropriate terms guidance on correct usage or recommended alternatives are provided. It provides a basic vocabulary for the description of stereochemical features.

A more comprehensive glossary is left for a second edition, or perhaps a combined glossary with other physical organic terms. Symbols used in stereochemical nomenclature are mentioned but details of their assignment and their incorporation into chemical names will be found in other publications of the relevant Commission.

Comments on the document are welcome and should be sent by 30 September 1993 to: Dr G. P. Moss, Department of Chemistry, Queen Mary and Westfield College, Mile End Road, London E1 4NS, UK.

Nomenclature for interlaboratory analytical studies (Recommendations 1992)

There are three major types of interlaboratory studies in which a group of laboratories analyse identical test portions from a homogeneous test sample. Each class is characterized by a self-defining designation according to purpose:

1 *Method-performance study*. A study in which all laboratories follow the same written protocol and use the same test method to measure a characteriestic (usually concentration of an analyte) in order to assess the performance parameters of a method.

2 *Laboratory-performance study*. A study in which laboratories use the method of their choice to measure a characteristic in order to assess the performance of the laboratory or analyst, usually to evaluate or improve performance.

3 *Material-certification study*. A study that assigns a reference value to a characteristic in the test material, usually with a stated uncertainty, using the 'best' laboratories and the least-biased methods. Vague terms such as 'round-robins', 'intercalibrations', 'ring tests', etc., should not be used.

Comments on the document are welcome and should be sent by 30 September 1993 to: Dr William Horwitz, Center for Food Safety and Applied Nutrition, HFF-7, Food and Drug Administration, Washington, DC 20204, USA.

Erratum

On page 18 of the January 1993 issue of *Chem. Intl.* we advised readers to send comments on the document 'Structure-based nomenclature for irregular single-strand organic polymers' to Prof. I. Mita. This was an unfortunate error. Comments should be sent to: Prof. K. Hatada, Department of Chemistry, Faculty of Engineering Science, Osaka University, Toyonanka, Osaka, 560 Japan. Our apologies to all concerned.

Glossary of class names of organic compounds and reactive intermediates based on structure

This is a glossary of terms used to denote classes of compounds, substituent groups and reactive intermediates, in contrast to individual compounds. The overwhelming majority of the terms refer to organic compounds, but a few classes that may be considered inorganic are included for convenience. The principal criterion for inclusion is that the class be definable by structure. Classes defined by use, characteristics, or origin are excluded. Class names that are plurals of systematic names for parent compounds are occasionally cited. Some terms are included that are not actually class names, but are commonly encountered components of class names. These are mostly prefixes, and defining their meanings permits a host of class names beginning with them to be dispenses with.

There is some overlap with other IUPAC documents, especially the *Glossary of Terms Used in Physical-Organic Chemistry*. Because the viewpoints are sometimes different, the wording of the definitions may in a few cases differ but most are reproduced verbatim.

The recommended class names (marked *) respect IUPAC nomenclature as presented in the 'Blue Book' (*Nomenclature of Organic Chemistry, Sections A, B, C, D, E, F and H*, 1979 edn, Pergamon Press, Oxford), the *Revised Nomenclature for Radicals, Ions, Radical Ions and Related Species, Recommendations 1992* and *A Guide to IUPAC Nomenclature of Organic Chemistry, including Revisions, Published and hitherto Unpublished, to the 1979 Edition of Nomenclature of Organic Chemistry, Recommendations 1992*.

Some class names are explicitly defined in the Blue Book for others the meaning is implicit. Many more class names are to be found in the chemical literature. A selection of the more important ones appear in this glossary. Some class names occuring mainly in the older literature have been included too. The compilers have considered customary usage and the need for clearly defined limits of meaning. Some compromises were necessary, but the definitions have survived scrutiny by the Commissions and consultants.

Recommended class names carry a reference to an official IUPAC publication. The status of the remaining entries varies from unreserved acceptance to outright rejection. Class names not derived from an official source may carry a reference to other literature. The definition of rejected class names is for information only; reasons for rejection are usually cited or indicated, and a cross-reference to the preferred class name is given.

A compound may belong to two or more different classes, e.g. it may be a ketone as well as an ester. Quite often composite names are then used, one class being denoted by an adjective, the second by a noun. The adjective and noun are separated by a space, thus oxo ester. However in the name of a specific compound there is no space between the prefix, indicating a specific substituent, and the name of the parent. Contrast e.g. α-amino carboxylic acids (class name) and 2-aminopentanoic acid (specific compound name).

Comments on the document are welcome and should be sent by 30 September 1993 to: Mr E. W. Godly, 10 Lawrence Avenue, New Malden, Surrey KT3 5LY, UK.

Publications

Prof. Takeo Saegusa

Organic-inorganic polymer hybrids

The International Symposium on New Polymers was held at the Kyoto Miyako Hotel in Kyoto, Japan, on 30 November – 1 December 1991. The symposium was sponsored by the IUPAC Macromolecular Division in conjunction with the Society of Polymer Sciences, Japan and attended by 130 Japanese polymer scientists and 82 participants from 17 countries outside Japan. Over a 2-day period, 17 invited lectures and 87 posters were presented. Most of the invited lectures were published in the December 1992 issue of *Die Makromolekulare Chemie: Macromolecular Symposia*. The Symposium Editor was Yukio Imanishi (Department of Polymer Chemistry, Kyoto University).

The symposium was organized in honour of Prof. Takeo Saegusa on his formal retirement from his chair at the Department of Synthetic Chemistry, Kyoto University. Saegusa was President of the IUPAC Macromolecular Division 1985–89.

The first paper in this volume of proceedings is by Saegusa and his colleague from Kyoto University, Yoshiki Chujo. The paper has the title ' Organic–inorganic polymer hybrids' and describes a group of new materials combining organic polymers and silica gel. The materials are formed by blending molecules of the two components by dispersion. These 'hybrid' materials are transparent and glassy.

According to the abstract of the paper, these hybrids are readily repared by the sol–gel reaction of $Si(OEt)_4$, the precursor of silica gel, in the presence of an organic polymer which consists of a repeating unit containing –N(R)–C(=O)– group (R = hydrogen or alkyl), that is, *N*-alkyl or *N*,*N*-dialkyl substituted carboxyl amide, urea and urethane groups. Hydrogen-bonding between these groups of the organic polymer component and the silanol group, which is a key intermediate of the sol–gel reactions, plays an important role in the formation of the homogeneous transparent materials. The formation of hydrogen bonds was established by FTIR spectroscopy.

Calcination of the transparent hybrid produced another interesting material of highly porous silica gel. At higher temperatures, for example 600°C, the organic polymer decomposed but the framework of silica gel remained unchanged. The space occupied by the organic polymer therefore becomes a pore. The new porous silica gel is characterized by a high inner surface area and a pore size of diameter around 200 nm (20 Ångströms).

Gas cylinders

The December 1992 issue of *iso bulletin* includes a news item by François Abram (Senior Tecnical Officer, ISO Central Secretariat, Geneva) on 'TC 58: Gas cylinders' (ISO = International Organization for Standardization).

Abram writes that gas cylinders are part of our everyday environment. They can be found everywhere: at home, in caravans, in boats (liquid petroleum gas cylinders), on camping grounds (butane cylinders), in fire-fighting equipment (CO_2, halon and other gas cylinders), in hospitals, in aircraft, for diving equipment (oxygen cylinders) in cars (LNG-, LPG, hydrogen cylinders, etc.), in factories and for bulk transport of gas (often in steel cylinders containing many types of sometimes dangerous gases).

In certain applications where weight is critical, aluminium gas cyclinders are used, for instance for parachutists, or composite materials cylinders for fire-fighters.

Cylinders sometimes need to stand up to extreme conditions in international transport, either in very hot regions (e.g. Saudi Arabia), or in very cold regions (e.g. Alaska). The handling of such cylinders must be safe, even in the event of fall or shock (for instance during transport by road).

Safety measures taken by companies and the observance of either regulatory or normative provisions ensure that accidents are rather uncommon but this may also lead us to forget the danger involved. However, when they do occur, accidents can be dramatic and remind us of the hard facts. The worst hazards are the risk of sudden explosion and emission of inflammable, toxic, infectious or radioactive gases.

The work of ISO Technical Committee TC 58, apart from ISO 10286 on terminology, covers all safety-related topics. It has spotlighted ten needs with regard to safety.

1 A number of standards have been published or are being developed for the design of cylinders made of different materials or for different gases, and for use under specific climatic conditions.

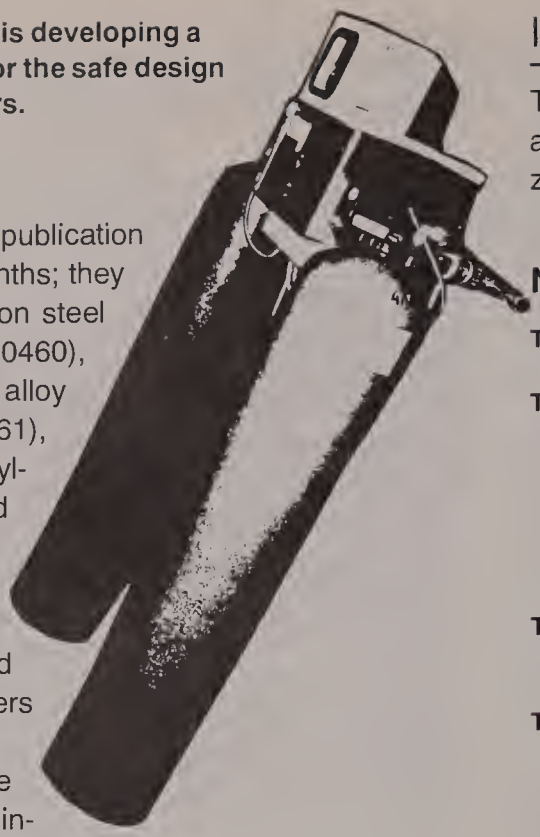
2 The standardization of fittings for gas cylinders, e.g. valve threads, should be perfectly airtight. Interchangeability should be adequate. The quality of fittings must be faultless. Valve protective caps should be efficient. Standards have been published or are in preparation covering all of these aspects with a view to eliminating hazards due to gas leakage.

3 Compatibility between gases and materials. For instance, metallic materials used for cylinder fittings should not be altered by the gas; a draft standard (CD 11114-1) is well under way.

4 Procedures for changing gas source in use. Here too, considerable care is required and a much needed draft (CD 11621) is in preparation.

5 Periodic inspection of gas cylinders. A first standard (ISO 6406) has been published for seamless steel gas cylinders. Four further standards dealing with periodic inspection and

ISO has published and is developing a number of standards for the safe design and use of gas cylinders.



testing are due for publication within the next few months; they deal with welded carbon steel gas cylinders (ISO 10460), seamless aluminium alloy gas cylinders (ISO 10461), dissolved acetylene cylinders (ISO 10462) and cylinders for permanent gases (ISO 10463). A draft is being finalized for liquefied petroleum gas cylinders (ISO/CD 10464).

6 Connected with the maintenance of gas cylinders is a need for standards for inspection at the time of filling in order to ensure proper safety. Four draft standards are in preparation.

7 Handling of gases and gas cylinders; these are also the subject of a draft standards.

8 Work on labelling (ISO 7225) and test methods for assessing gases in relation to hazards must continue. An International Standard (ISO 10156) on determination of fire potential and oxidizing ability for the purpose of selecting cylinder valve outlets has been published. A draft standard on determination of the toxicity of a gas mixture is well advanced. A draft on determination of the corrosiveness of gases in relation to textiles is to be addressed very soon. This work deals with the difficult problem of classifying gases according to the dangers involved and with information for transporters, handlers and public safety services, etc.

9 Methods governing the marking of cylinders by the manufacturer.

10 A programme for a world-wide quality assurance system will round off the series.

Classifying atmospheric corrosivity

The December 1992 issue of *iso bulletin* also includes a 6-page article by Sheldon W. Dean on 'Classifying atmospheric corrosivity: A challenge of ISO'. Dean has been a member of the USA Task Group for ISO/TC 156 *Corrosion of metals and alloys* since 1976.

The article covers classification of the atmosphere and various ISO standards concerned with classification of atmospheric corrosivity including:

ISO 9223	Corrosion of metals and alloys – Classification of the corrosivity of atmospheres.
ISO 9224	Corrosion of metals and alloys – Guiding values for the corrosivity categories of atmospheres.
ISO 9225	Corrosion of metals and alloys – Aggressivsity of atmospheres – Methods of measurement of pollution data.
ISO 9226	Corrosion of metals and alloys – Corrosivity of atmospheres – Methods of determination of corrosion rate of standard specimens for the evaluation of corrosivity.

ISO Standards

The following are some of the new international standards announced by the International Organization for Standardization (ISO) in recent issues of *ISO Bulletin*:

November 1992 issue of *ISO Bulletin:*

TC34	**Agricultural food products**
ISO 5502:1992	Oilseed residues – Preparation of test samples
TC 35	**Paints and varnishes**
ISO 8502-3:1992	Preparation of steel substrates before application of paints and related products – Tests for the assessment of surface cleanliness – Part 3: Assessment of dust on steel surfaces prepared for painting (pressure-sensitive tape method)
TC 82	**Mining**
ISO 10098:1992	Wireline diamond core drilling equipment – System CSSK
TC 102	**Iron ores**
ISO 9516:1992	Iron ores – Determination of silicon, calcium, manganese, aluminium, titanium, magnesium, phosphorus, sulfur and potassium – Wavelength dispersive X-ray fluorescence spectrometric method
TC 107	**Metallic and other inorganic coatings**
ISO 1460:1992	Metallic coatings – Hot dip galvanized coatings on ferrous materials – Gravimetric determination of the mass per unit area
TC 147	**Water quality**
ISO 9887:1992	Water quality – Evaluation of the aerobic biodegradability of organic compounds in an aqueous medium – Semi-continuous activated sludge method (SCAS)
TC 153	**Valves**
ISO 10497:1992	Testing of valves – Fire typesetting requirements
TC 180	**Solar energy**
ISO 9845-1:1992	Solar energy – Reference solar spectral irradiance at the ground at different receiving conditions – Part 1: Direct normal and hemispherical solar irradiance for air mass 1,5

December 1992 issue of *ISO Bulletin:*

TC 12	**Quantities, units, symbols, conversion factors**
ISO 31-5:1992	Quantities and units – Part 5: Electricity and magnetism
ISO 31-10:1992	Quantities and units – Part 10: Nuclear reactions and ionizing radiations
ISO 1000:1992	SI units and recommendations for the use of their multiples and of certain other units
TC 22	**Road vehicles**
ISO 1585:1992	Road vehicles – Engine test code – Net power
ISO 3917:1992	Road vehicles – Safety glazing materials – Test methods for resistance to radiation, high temperature, humidity, fire and simulated weathering
TC 23	**Tractors and machinery for agriculture and forestry**
ISO 5681:1992	Equipment for crop protection – Vocabulary
TC 28	**Petroleum products and lubricants**
ISO 91-1:1992	Petroleum measurement tables – Part 1: Tables based on reference temperatures of 15°C and 60°F
TC 34	**Agricultural food products**
ISO 663:1992	Animal and vegetable fats and oils - Determination of insoluble impurities content
ISO 5529:1992	Wheat – Determination of sedimentation index – Zeleny test

TC 38	**Textiles**
ISO 105-B06:1992	Textiles – Tests for colour fastness – Part B06: Colour fastness to artificial light at high temperatures: Xenon arc fading lamp test
TC 61	**Plastics**
ISO 10119:1992	Carbon fibre - Determination of density
TC 6?	**Glass containers**
ISO 9100:1992	Wide-mouth glass containers – Vacuum lug finishes – Dimensions
TC 65	**Manganese and chromium ores**
ISO 310:1992	Manganese ores and concentrates – Determination of hygroscopic moisture content in analytical samples – Gravimetric method
TC 79	**Light metals and their alloys**
ISO 10215:1992	Anodized aluminium and aluminium alloys – Visual determination of image clarity of anodic oxidation coatings – Chart scale method
ISO 10216:1992	Anodized aluminium and aluminium alloys – Instrumental determination of image clarity of anodic oxidation coatings – Instrumental method
TC 134	**Fertilizers and soil conditioners**
ISO 8189:1992	Solid fertilizers – Determination of moisture content – Gravimetric method by drying under reduced pressure
ISO 8190:1992	Solid fertilizers – Determination of moisture content – Gravimetric method by drying at 105 ± 2°C
TC 147	**Water quality**
ISO 5667-9:1992	Water quality – Sampling – Part 9: Guidance on sampling from marine waters
ISO 5667-10:1992	Water quality – Sampling – Part 10: Guidance on sampling of waste waters
TC 155	**Nickel and nickel alloys**
ISO/TR 9721:1992	Nickel and nickel alloys – Rules for material description based on chemical symbols
ISO 9722:1992	Nickel and nickel alloys – Composition and forms of wrought products

January 1993 issue of *ISO Bulletin:*

TC 5	**Ferrous metal pipes and metallic fittings**
ISO 2037:1992	Stainless-steel tubes for the food industry
TC 6	**Paper, board and pulps**
ISO 11004:1992	Paper and board – Determination of air permeance – Low range
TC 27	**Solid mineral fuels**
ISO 334:1992	Solid mineral fuels – Determination of total sulfur – Eschka method
TC 34	**Agricultural food products**
ISO 5504:1992	Oilseed residues – Determination of total isothiocyanate content and vinylthiooxazolidone content
ISO 7973:1992	Cereals and milled cereal products – Determination of the viscosity of flour – Method using an amylograph
ISO 9832:1992	Animal and vegetable fats and oils – Determination of residual technical hexane content
TC 35	**Paints and varnishes**
ISO 1513:1992	Paints and varnishes – Examination and preparation of samples for testing
ISO 4622:1992	Paints and varnishes - Pressure test for stackability
ISO 8130-1:1992	Coating powders – Part 1: Determination of particle size distribution by sieving
ISO 8130-2:1992	Coating powders – Part 2: Determination of density by gas comparison pyknometer (referee method)
ISO 8130-3:1992	Coating powders – Part 3: Determination of density by liquid displacement pyknometer
ISO 8130-4:1992	Coating powders – Part 4: Calculation of lower explosion limit
ISO 8130-6:1992	Coating powders – Part 6: Determination of gel time of thermosetting coating powders at a given temperature
ISO 8130-7:1992	Coating powders – Part 7: Determination of loss of mass on stoving
ISO 8130-9:1992	Coating powders – Part 9: Sampling
ISO 8504-1:1992	Preparation of steel substrates before application of paints and related products - Surface preparation methods – Part 1: General principles
ISO 8504-2:1992	Preparation of steel substrates before application of paints and related products – Surface preparation methods – Part 2: Abrasive blast-cleaning
ISO 9514:1992	Paints and varnishes – Determination of the pot-life of liquid systems – Preparation and conditioning of samples and guidelines for testing
TC 42	**Photography**
ISO 519:1992	Photography – Hand-held cameras – Flash-connector – Dimensions
ISO 3897:1992	Photography – Processed photographic plates – Storage practices
ISO 5466:1992	Photography - Processed safety photographic films - Storage practices
ISO 6051:1992	Photography – Processed photographic paper prints - Storage practices
ISO 6846:1992	Photography – Black-and-white continuous-tone papers – Determination of ISO speed and ISO range for printing
TC 45	**Rubber and rubber products**
ISO/TR 11753:1992	Rubber and rubber products – Confidence intervals of repeatability and reproducibility values determined by interlaboratory tests
TC 46	**Information and documentation**
ISO 8459-2:1992	Information and documentation – Bibliographic data element directory – Part 2: Acquisitions applications
TC 58	**Gas cylinders**
ISO 10286:1992	Gas cylinders – Terminology
TC 61	**Plastics**
ISO 4591:1992	Plastics – Film and sheeting – Determination of average thickness of a sample, and average thickness and yield of a roll, by gravimetric techniques (gravimetric thickness)
ISO 4592:1992	Plastics – Film sheeting – Determination of length and width
ISO 7808:1992	Plastics – Thermosetting moulding materials – Determination of transfer flow
ISO 10351:1992	Plastics – Determination of the combustibility of specimens using a 125-mm flame source
ISO/TR 10353:1992	Plastics – Survey of ignition sources used for national and international fire tests
ISO 10363:1992	Hot-melt adhesives – Determination of thermal stability
TC 76	**Transfusion, infusion and injection equipment for medical use**
ISO 11040-1:1992	Prefilled syringes – Part 1: Glass cylinder for dental local anaesthetic cartridges
TC 79	**Light metals and their alloys**
ISO 6363-5:1992	Wrought aluminium and aluminium alloy cold-drawn rods/bars and tubes – Part 5: Drawn square and hexagonal bars – Tolerances on form and dimensions
TC 84	**Medical devices for injections**
ISO 6009:1992	Hypodermic needles for single use – Colour coding for identification
TC 87	**Cork**
ISO 1997:1992	Granulated cork and cork powder – Classification, properties and packing
TC 102	**Iron ores**
ISO 2598-1:1992	Iron ores – Determination of silicon content – Part 1: Gravimetric methods
ISO 2598-2:1992	Iron ores – Determination of silicon content – Part 2: Reduced molybdosilicate spectophotometric method

ISO 4688-1:1992	Iron ores – Determination of aluminium content – Part 1: Flame atomic absorption spectrometric method
ISO 9686:1992	Direct reduced iron – Determination of carbon and/or sulfur content – High-frequency combustion method with infrared measurement
ISO 10203:1992	Iron ores – Determination of calcium content – Flame atomic absorption spectrometric method
ISO 10204:1992	Iron ores – Determination of magnesium content – Flame atomic absorption spectrometric method
TC 106	**Dentistry**
ISO 7711-2:1992	Dental rotary instruments – Diamond instruments – Part 2:Discs
ISO 7711-3:1992	Dental rotary instruments – Diamond instruments – Part 3: Grit sizes, designation and colour code
ISO 10477:1992	Dentistry – Polymer-based crown and bridge materials
TC114	**Horology**
ISO 3160-2:1992	Watch cases and accessories – Gold alloy coverings – Part 2: Determination of fineness, thickness, corrosion resistance and adhesion
TC 134	**Fertilizers and soil conditioners**
ISO 5308:1992	Solid fertilizers – Method of checking the performance of mechanical devices for sampling of product moving in bulk
ISO 8633:1992	Solid fertilizers – Simple sampling method for small lots
ISO 10084:1992	Solid fertilizers – Determination of mineral-acid-soluble sulfate content – Gravimetric method
TC 146	**Air quality**
ISO 7935:1992	Stationary source emissions – Determination of the mass concentration of sulfur dioxide – Performance characteristics of automated measuring methods
TC 147	**Water quality**
ISO 9696:1992	Water quality – Measurement of gross alpha activity in non-saline water – Thick source method
ISO 9697:1992	Water quality – Measurement of gross beta activity in nonsaline water
ISO 10304-1:1992	Water quality – Determination of dissolved fluoride, chloride, nitrite, orthophosphate, bromide, nitrate and sulfate ions, using liquid chromatography of ions – Part 1: Method for water with low contamination
ISO 10359-1:1992	Water quality – Determination of fluoride – Part 1: Electrochemical probe method for potable and lightly polluted water
TC 155	**Nickel and nickel alloys**
ISO 9723:1992	Nickel and nickel alloy bars
ISO 9724:1992	Nickel and nickel alloy wire and drawing stock
ISO 9725:1992	Nickel and nickel alloy forgings
ISO/TR 11434:1992	Nickel alloys – Determination of niobium and tantalum – Ion exchange method
TC 159	**Ergonomics**
ISO 9241-1:1992	Ergonomic requirements for office work with visual display terminals (VDTs) – Part 1: General introduction
ISO 9241-2:1992	Ergonomic requirements for office work with visual display terminals (VDTs) – Part 2: Guidance on task requirements
ISO 9241-3: 1992	Ergonomic requirements for office work with visual display terminals (VDTs) – Part 3: Visual display requirements
TC 174	**Jewellery**
ISO 10713:1992	Jewellery – Gold alloy coatings
TC 175	**Fluorspar**
ISO 4282:1992	Acid-grade and ceramic-grade fluorspar – Determination of loss in mass at 105°C
ISO 5437:1992	Acid-grade and ceramic-grade fluorspar – Determination of barium sulfate content – Gravimetric method

Health and Safety Guide on PCBs and PCTs

International Programme on Chemical Safety (IPCS) Health and Safety Guide No. 68 is entitled *Polychlorinated Biphenyls (PCBs) and Polychlorinated Terphenyls Health and Safety Guide*. This is a companion volume to Environmental Health Criteria 140: *Polychlorinated Biphenyls and Terphenyls* (2nd edition).

The Health and Safety Guides are published by the World Health Organization (WHO) for IPCS – a collaborative programme of the United Nations Environment Programme (UNEP), the International Labour Organisation (ILO) and WHO.

In the introduction to each guide, the IPCS Director writes that the Environmental Health Criteria (EHC) documents produced by the International Programme on Chemical Safety include an assessment of the effects on the environment and on human health of exposure to a chemical or combination of chemicals, or physical or biological agents They also provide guidelines for setting exposure limits.

The purpose of a Health and Safety Guide is to facilitate the application of these guidelines in national chemical safety programmes. The first three sections of a Health and Safety Guide highlight the relevant technical information in the corresponding EHC. Section 4 includes advice on preventive and protective measures and emergency action; health workers should be thoroughly familiar with the medical information to ensure that they can act efficiently in an emergency. The section on regulatory information has been extracted from the legal file of the International Register of Potentially Toxic Chemicals (IRPTC) and from other United Nations sources.

The target readership includes occupational health services, those in ministries, governmental agencies, industry, and trade unions who are involved in the safe use of chemicals and the avoidance of environmental health hazards, and those wanting more information on this topic. An attempt has been made to use only terms that will be familiar to the intended user. However, sections 1 and 2 inevitably contain some technical terms. A bibliography has been included for readers who require further background information.

The following is the latest list of Health and Safety Guides that are available:

1 Acrylonitrile
2 Kelevan
3 1-Butanol
4 2-Butanol
5 2,4-Dichlorphenoxy-acetic Acid (2,4-D)
6 Methylene Chloride
7 *tert*-Butanol
8 Epichlorohydrin
9 Isobutanol
10 Tetrachloroethylene
11 Tetradifon
12 Tecnazene
13 Chlordane
14 Heptachlor
15 Propylene Oxide
16 Ethylene Oxide
17 Endosulfan
18 Dichlorvos
19 Pentachlorophenol
20 Dimethoate
21 Aldrin and Dieldrin
22 Cypermethrin
23 Quintozene
24 Allethrins
25 Resmethrins
26 Pyrrolizidine Alkaloids
27 Magnetic Fields
28 Phosphine
29 Dimethyl Sulfate
30 Deltamethrin
31 Tetramethrin
32 *d*-Phenothrin
33 Permethrin
34 Fenvalerate
35 Phosphorus Trichloride and Phosphorus Oxychloride
36 Vinylidene Chloride

37 Ammonia
38 Cyhalothrin and Lambda-Cyhalothrin
39 Mirex
40 Camphechlor
41 Chlordecone
42 Vanadium
43 Dimethylformamide
44 Beryllium
45 Acrylamide
46 Barium
47 Atrazine
48 Bentazone
49 Captafol
50 Captan
51 Paraquat
52 Diquat
53 Alpha- and Beta-Hexachlorocyclohexanes
54 Lindane
55 1,2-Dichloroethane
56 Hydrazine
57 Formaldehyde
58 Methyl Isobutyl Ketone
59 *n*-Hexane
60 Endrin
61 Isobenzan
62 Nickel, Nickel Carbonyl, and some Nickel Compounds
63 Hexachlorocyclopentadiene
64 Aldicarb
65 Fenitrothion
66 Trichlorfon
67 Acrolein
68 Polychlorinated biphenyls and polychlorinated terphenyls (PCBs and PCTs)
69 Dimethylarsinic acid, methanearsonic acid, and salts
70 Inorganic arsenic compounds other than arsine
71 Trimellitic anhydride
72 Folpet
73 Rotenone
74 Parathion
75 Methyl Parathion
76 1,3-Dichloropropene, 1,2-Dichloropropane, and mixtures of 1,3-Dichloropropene and 1,2-Dichloropropane
77 Propachlor

The Health and Safety Guides are priced CHF 5.00 each (CHF 3.50 in developing countries) For further information please contact: WHO, Distribution and Sales, 1211 Geneva 27, Switzerland.

Longest index in the world

On page 87 of the May 1988 of *Chem. Intl.* we published a short news item on the 'Longest index in the world' citing statistics for the *Chemical Abstracts (CA) Eleventh Collective Index* (1982-1986).

IUPAC affiliate W. Val Metanomski (Senior Editorial Advisor, Office of the Editor, CAS) reports that in 1992, Chemical Abstracts Service published an even longer index, the *Chemical Abstracts (CA) Twelfth Collective Index* covering the period 1987–91.

This index consists of

	115	books
containing	35 137 626	index entries
in	215 880	pages
citing	3 052 700	documents
occupying space of	22	ft (6.7 m)
and weighing	544	lbs (246.7 kg)

The set of 115 books consists of:
2 books of the *Index Guide*
23 books of the *General Subject Index*
51 books of the *Chemical Substance Index*
19 books of the *Formula Index*
17 books of the *Author Index*
3 books of the *Patent Index*

Metanomski says that it is worth noting that the production of this index started in January 1992 and the last of the 115 books was mailed to the subscribers within less than a year, on 8 December 1992. He adds that it is interesting to compare this index with the earlier 5-year *CA Collective Indexes*:

7th	(1962–66)	24	books
8th	(1967–71)	35	books
9th	(1972–76)	57	books
10th	(1977–81)	75	books
11th	(1982–86)	93	books
12th	(1987–91)	115	books.

CAS has informed the Editor of the *Guinness Book of World Records* of this new record and is confident that it will be recognized in their new edition.

CAS is also offering now the same *CA Twelfth Collective Index* (*12th CI*) on just four 12-cm CD-ROM discs. This electronic version, in addition to providing the same familiar access points for searching and browsing, also allows searching by CAS Registry Numbers and Boolean searching of author and title information.

For further information, please contact: Chemical Abstracts Service, 2540 Olentangy River Road, PO Box 3012, Columbus, OH 43210, USA. Tel. +1 (614) 447 3600. Fax. +1 (614) 447 3713.

Kathy Delker, the CAS Product Manager for CD-ROM, displays the *CA 12th CI* on four CD-ROM discs against the background of 115 printed books.

News & Views

Eastern European scientists at IUPAC-sponsored symposia

At the IUPAC Bureau meeting held in Oxford, September 1992, there was discussion of how to facilitate the participation of chemists from eastern European countries at IUPAC-sponsored symposia throughout the world. The consensus view was that, for the next three years, organizers of these symposia might be willing to consider applying student-level registration fees for eastern European chemists.

On behalf of IUPAC President Bard, the IUPAC Secretariat in Oxford is now writing to the organizers of future IUPAC-sponsored conferences asking them to give serious consideration to applying the above suggestion in the light of the severe financial difficulties in which eastern European countries currently find themselves under the much changed national circumstances of earlier years.

Hidalgism exposed in Switzerland

Gaston H. Gonnet and Steven A. Benner (Institute for Scientific Computation, and Institute for Organic Chemistry, ETH, Zurich, Switzerland) posed themselves the question 'What is the longest word spelled out in the sequence of a protein in the protein squence database using the one-letter code for amino acids?' In their letter to *Nature* (**361**, 121, 1993) they report that the longest word found to date contains only seven letters.

Gonnet and Benner matched the entire *Oxford Unabridged English Dictionary* (2nd edition, 20 volumes, 572 728 830 characters, with information content close to that of the human genome) against the entire SwissProt protein sequence database (version 23).

After 23 minutes of computational time they found two words with nine characters. The first was 'hidalgism' which entered the English dictionary via a citation from 1887, and appears at positions 247–355 on the integrase of bacteriophase lambda. 'Hidalgism' means the manner or practice of a hidalgo, a hidalgo being a 'Spanish nobleman of the lowest class' or more simply a 'gentleman'.

The other nine-character word they found was 'ensilists' which appears at positions 81–89 of the PRRB protein from *Escherichia coli*. The word 'ensilist' entered the dictionary via a citation from 1883. An ensilist is one who preserves crops by ensilage. Ensilage is 'the storing of green fodder in pits or silos'.

Gonnet and Benner conclude, in their letter, that in addition to being the longest strings appearing simultaneously in the English and protein languages, these are also candidates for the most unusable pieces of information simultaneously in lexicography and in biochemistry. They add however, that their discovery does demonstrate the power of these data structures in handling large amounts of information.

Clean air measurement

The topic chosen for the 7th OIML (*L'Organisation Internationale de Métrologie Légale*) technical seminar was air pollution measurements including measuring instruments for vehicle exhaust gas, continuous monitoring of ambient air and control of stack gas emissions. The seminar has held in Interlaken, Switzerland, on 28 September – 1 October 1992. A report on this workshop including summaries of presentations was published in *Bulletin OIML*, **129**, December 1992.

This issue also contains the texts of the following papers presented at the seminar:

- 'International development of standards for air quality' by A. Aronds, Chairman and K. Grefen, Secretary, ISO/TC 146 'Air quality'.
- 'European standards for air quality measurement: Actual development' by J-F. Vicard, Chairman, CEN/TC 264 'Air quality'.
- 'New methods of identifying gross polluting vehicles in the United States of America' by W. B. Clemmens, U.S. Environmental Protection Agency and S. E. Chappell, U.S. National Institute of Standards and Technology.
- 'Multicomponent continuous measurement of automotive emissions using FTIR spectrometer' by M. Adachi, Horiba Limited, Kyoto, Japan.

For further information on OIML, please contact: Bureau International de Métrologie Légale, 11, Rue Turgo, 75009 Paris, France. Tel. +33 (1) 48 78 12 82/42 85 27 11. Fax. +33 (1) 42 82 17 27.

The OIML seminar in Zürich dealt with clean air quality including methods of measuring vehicle emissions.

Is Lake Geneva solvent?

It may come as no surprise to you that a certain sector of the readership of any magazine or journal always takes great delight in spotting 'howlers'. In order to please this section of the *CI* readership, we occasionally, if not regularly, include, albeit unconsciously, at least one blatant error in the magazine. A sparkling example of this instinctive drive to please all our readers occurred on the inside front cover of the January 1993 issue.

The caption at the foot of the cover read 'Solvents (*Courtesy Hoechst AG*)' and indeed the front cover did show a large puddle of aqueous solvent – generally known as Lake Geneva (*Lac Leman*). The caption actually referred to the front cover photo of the *previous* issue. The caption for the front cover photo of the January issue should have read 'Geneva – venue of the Centenary Symposium'. Our apologies to all concerned.

We regret to record the deaths of

Prof. D. Behrens, Federal Republic of Germany (12 June 1992) – CHEMRAWN Committee (1976–80), Applied Chemistry Division Committee (1989–92).

Dr H. Geissbühler, Switzerland (9 February 1992) – Commission on Terminal Pesticide Residues (1971–78).

Dr O. Isler, Switzerland (28 September 1992) – Bureau (1971–79).

Prof. F. Lazarini, Yugoslavia (8 January 1992) – Commission on Nomenclature of Inorganic Chemistry (1989–92).

Prof. G. Milazzo, Italy (5 January 1993) – Commission on Electrochemistry (1961–75), Commission on Physico-chemical Measurements and Standards (1973–83).

Dr A. J. de Vries, France (14 January 1993) – Macromolecular Division Committee (1971–79), Commission on Polymer Characterization and Properties (1977-85).

Chemistry at your fingertips

According to the makers, St Andrews Electronics Limited, their new CH109 calculator is what every chemist has been waiting for. In addition to the usual facilities of a scientific calculator, it is a versatile and time-saving data bank chemical calculator giving you 'chemistry at your fingertips'.

The CH109 enables you to key in formulae directly. At the touch of a button you then have access to empirical formulae and molecular weights, percentage elemental composition, conversion factors and fundamental constants, solvent boiling points and densities, and many more physicochemical features. The calculator can also be used to balance equations, calculate yields of reactions and carry out many technocommercial calculations.

The CH109 has a large internal database incorporating: all 109 chemical elements, isotopes, amino acids, solvents, groups and ligands. The makers claim that it will be an indispensable device for everyone in chemistry-related professions: production chemists, R&D chemists, commercial executives, analysts, spectroscopists, materials scientists, bio-, organic, physical, inorganic and pharmaceutical chemists, environmental scientists, chemical engineers, physicists, geologists, ceramists, etc.

The calculator is pocket-sized and incorporates a timer/alarm and a statistics package; its educational capabilities also make it ideal for staff and students in higher education and research. The database contains internationally recommended values and IUPAC notation and SI units.

The CH109 Calculator is priced GBP 129 + VAT and postage and packing. Quantity and educational discounts are available. For further information and a colour leaflet please contact: St Andrews Electronics Limited, Technology Centre, North Haugh, St Andrews, Fife KY16 9SR, Scotland, UK. Tel. +44 (334) 73301; fax +44 (334) 76493.

The CH109 Calculator.

Resignations and new appointments

Professor H. Heikkinen has resigned as Secretary of the Committee on Teaching of Chemistry. His successor as CTC Secretary is Drs J. Bouma, whose address is: Postacademisch Onderwijs in de Natuurwetenschappen, Schipholweg 94, 2316 XD Leiden, the Netherlands. Tel: +31 (30) 204496/(71) 214155. Fax: +31 (71) 226549.

Dr Werner Koch has resigned as Secretary of the Organic Chemistry Division. His appointed successor is Professor Jean-Clauder Richer, whose address is: Département de Chimie, Université de Montréal, CP 6128, Succursale A, Montréal, Québec H3C 3J7, Canada. Tel. +1 (514) 343 6744. Telex 055 60944 CA. Fax +1 (514) 343 6624.

Both appointments are subject to the approval of IUPAC President Allen Bard.

Affiliate Affairs

Solubility data series – discounts

Members of IUPAC commissions and committees and IUPAC affiliates may purchase volumes of the *Solubility Data Series* at reduced prices:

- USD 35.00 for members whose names appear in the *IUPAC Handbook* or for any individual whose institution has a library subscription.
- USD 77.50 for IUPAC affiliate members.

Volumes 48–52 in the series were reviewed in *Chem. Intl.* **14**, 226–7, 1992.

Place your orders directly with your nearest Pergamon agency, or use the Pergamon Hotline Service in Oxford; tel. +44 (865) 743685.

How to contact commissions

IUPAC affiliates are entitled to communicate directly on scientific matters with the officers of IUPAC comissions. A full list of names and addresses of all commission officers for 1991–93 was published on pages 223–233 of the November 1991 issue of *CI*. Photocopies of this list are available upon request from the Affiliate Affairs Secretary.

IUPAC-sponsored conferences

If you are interested in attending a conference please apply directly to the conference organizers for the conference circulars and registration forms. An updated list of names and addresses of the organizers of all future IUPAC-sponsored conferences is given in the 'Conference Calendar' published in each issue of *CI*.

Affiliate reduction of conference registration fees

It is a condition of IUPAC sponsorship of a conference that IUPAC affiliates are entitled to a 10% reduction or 'own members' rate on the registration fee for scientific participants. This concession is usually – but not always – announced in the conference circulars and indicated on the registration form.

To receive this reduction an affiliate must declare on the conference registration form that (s)he is an affiliate. Alternatively the affiliate should apply in writing to the conference organizer for this reduction stating that (s)he is an affiliate. Conference organizers may check with the IUPAC Secretariat that applicants for this reduction are currently registered as affiliates.

If an application for this reduction is refused, an affiliate should immediately notify the Affiliate Affairs Secretary and, if possible, forward copies of documentary evidence of this refusal

Address of IUPAC Secretariat

Please use the following address for all communications directed to the IUPAC Affiliate Affairs Secretary. If you are submitting a letter for publication in *Chemistry International* (*CI*), please indicate that the letter is 'Submitted for publication in *CI*.'

Affiliate Affairs Secretary
IUPAC Secretariat
Bank Court Chambers
2-3 Pound Way
Templars Square
Cowley
Oxford OX4 3YF
UK

Tel: +44 (865) 747 744
Fax: +44 (865) 747 510
Telex: 83147 VIA OR G
attn. IUPAC
E-mail: IUPAC@VAX.OXFORD.AC.UK.

IUPAC publications

Affiliates are entitled to a 25% reduction and in some cases a 40% reduction on the cost of IUPAC publications except the scientific journal *Pure and Applied Chemistry*. A leaflet detailing IUPAC books currently available from Blackwell Scientific Publications has recently been distributed by the publishers to all *CI* readers. Further copies may be obtained from the IUPAC Secretariat.

Ties and scarves

IUPAC ties and scarves may be purchased from the IUPAC Secretariat by applying to the Affiliate Affairs Secretary. The colours for both are *either* maroon *or* navy (dark) blue. The ties cost USD 14.00/GBP 7.00 each and the scarves USD 12.00/GBP 6.00 (including postage and packing).

Please use the form (or a photocopy of it) published on page 170 of the September 1992 issue of *CI*. Alternatively please write to the Affiliate Affairs Secretary with your order stating the colour you require. A cheque made payable to IUPAC for the appropriate amount should be enclosed with your order.

IUPAC poster

Copies of an IUPAC poster (see page 214 of the November 1990 issue of *CI*) are available **free of charge** to affiliates and members of IUPAC's commissions and committees. The poster is printed in maroon and black on a white background and is approximately 42 × 59 cm in size.

IUPAC welcomes any publicity you can give to its activities. If you would like to display one or more copies of the poster in your department or elsewhere please write to the Affiliate Affairs Secretary stating your name and address and how many copies of the poster you wish to receive.

Commission & Committee News

Chemistry and industry

The 15th meeting of the Committee on Chemistry and Industry (COCI) was held in Stockholm, Sweden, on 4–5 September 1992. Seventeen countries are now represented on the Committee.

Three major topics were discussed at the meeting and these gave rise to the following points:

1 The 2nd IUPAC Workshop on Safety in Chemical Production will be held in Yokohama, Japan in 1993. This will be followed by a third workshop which will take place in the USA in 1995.

2 The Committee decided to study the feasibility of organizing a programme of events on 'Chemistry for life' to celebrate, in 1994, the 75th anniversary of IUPAC in each country and in the three regions Asia, Europe and Asia.

3 COCI has stressed that coordination should continue across Commissions and Divisions in domains such as materials and environment.

4 It was suggested that IUPAC by-laws are modified in order to extend the maximum duration of membership of COCI officers from 10 to 12 years.

5 COCI unaminously supports the amendment of IUPAC Statutes requiring Divisions to present their programmes ranked in order of priority.

The next COCI meeting will take place in Lisbon, Portugal, on 8–9 August 1993.

René-Paul Martin

Nomenclature of inorganic chemistry

The Commission on Nomenclature of Inorganic Chemistry (II.2) met at the University of Geneva, Switzerland, on 16–18 July 1992, to celebrate the 100th anniversary of the Geneva conference. The meeting was organized by Prof. Alan Williams and was attended by 7 titular member, 5 associate members, and 7 observers.

The status of Red Book, Part II

The Red Book, Part II is well advanced and is nearing completion. Whereas the Red Book I dealt with general principles of inorganic nomenclature, Red Book II provides a treatise in specialized topics. The editor of Red Book II is Prof. J.A. McCleverty from the University of Bristol. The book contains eight chapters:

1 Iso and heteropolyanions.
2 Isotopically modified compounds and hydron.
3 Nitrogen hydrides and derived cations, anions, and ligands.
4 Single-strand and quasi single-strands polymers.
5 Inorganic rings and chains.
6 Metal complexes of tetrapyrroles.
7 Ligand abbreviations.
8 Inorganic radicals.

The Commission on Nomenclature of Inorganic Chemistry (CNIC) met in Geneva in 1992.

Chapters 1–4 have already appeared in *Pure and Applied Chemistry*. They are revised in the light of Red Book I and are ready for inclusion in Red Book II. The chapter on inorganic rings and chains, currently comprises two manuscripts, one dealing with monocyclic and simple chain compounds and the other with polycyclic and branched chain compounds. The former is presently in the 8-month period of public review with the latter following shortly. These manuscripts are presently being fused into one Red Book chapter. The manuscripts of chapters 7 and 8 are also finished and are being reviewed by external experts. The new chapter on the nomenclature of inorganic radicals is also in the advanced state of completion. This year CNIC concentrated on reviewing the second draft of the manuscript. The chapter is expected to be completed during the next year's meeting in Lisbon. It seems feasible that Red Book, Part II will appear by the end of 1995 as originally intended.

Organometallic chemistry

Nomenclature of organometallic compounds is one of the principal projects in the coming years. This is necessarily a joint project of CNIC and CNOC (Commission on Nomenclature of Organic Chemistry). It is expected that different aspects of organometallic nomenclature will be compiled together into a Red/Blue Book. The following fields of organometallic compounds need to be explored:

1 *The organometallic compounds of heavier group 14 elements.* These compounds can be named both by using coordination and substitutive nomenclature. There is a joint CNIC/CNOC working party comparing the advances and disadvances of different usages.

2 *Naming of organic ligands.* There is a new working party considering different aspects of this controversial topic.

3 *The structural nomenclature of organometallic clusters.* The work on combining the structural descriptor of Casey Evans and Powell with that of Coucouvanis. The former can conveniently describe the connectivities within the cluster framework, whereas the latter can express the spatial relationships of the cluster atoms. The present problems involve the selection of the reference axis and the reference plane in the case of low-symmetry clusters.

Computer applications in inorganic nomenclature

This is a new project for CNIC. There is a working party that is convened by Prof. G. Bergerhoff (Universität Bonn) and Prof. A. Dress (Universität Bielefeld).

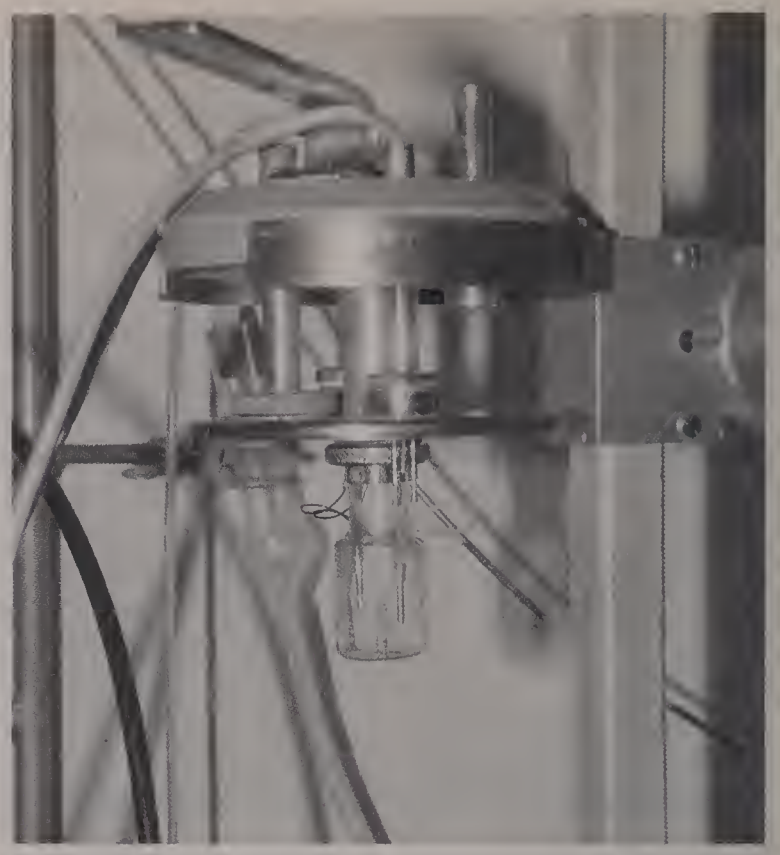
The use of a computer as a routine tool in chemical nomenclature provides a basis for the communication between experts in different disciplines. The goal is to utilize various chemical data bases as efficiently as possible.

It is necessary to define unambiguously the required input information as well as the desired output when preparing a nomenclature program. Input can be the qualitative or functional description of a molecule. The output consists of either a phenotype name or a genotype name (code) of the molecule.

The phenotype name is the conventional name of a compound and it needs to be consistent with the existing nomenclature rules that will naturally develop in the course of time. The genotype name contains much more information about the compound than the phenotype name. It is composed of numerical information (for example, crystal coordinates). The genotype information is only used by a computer in forming the phenotype name and it is not intended for use by the end user of the nomenclature program.

The next meeting of the Commission on Nomenclature of Inorganic Chemistry will be held in Lisbon on 6–8 August 1993.

Risto Laitinen



Solution calorimeter at the Chemical Centre, Lund University, Sweden. Commission I.2's work on *Experimental Thermodynamics*, Vol. IV: *Solution Calorimetry* has been completed.

Chemical thermodynamics

When the Commission on Thermodynamics (I.2) met in Snowbird, Utah, USA, on 15–16 August 1992, it reviewed the status of its projects.

The first volume of the *Electrolyte Solution Data Series* dealing with methanol solutions has been printed. The second volume on ethanol and propanol solutions is to follow.

The work on *Experimental Thermodynamics*, Vol. IV. *Solution Calorimetry* has been completed but at the time of the meeting Blackwell Scientific Publications had not decided whether to publish this volume or not.

A project on 'Fast Ion Conductors' has been approved by IUPAC and received some seed money from IUPAC's 'horizontal' programme on Chemistry and Advanced Materials. The low-temperature adiabatic calorimetry now underway is the first stage of the work and is to serve as catalyst to involve experimentalists using complementary techniques. The second stage is to include a symposium as part of the 13th IUPAC Conference on Chemical Thermodynamics to be held in Clermont-Ferrand, France, in July 1994. Project leader Prof. Weir will contact other Commissions to recruit members from other fields to join the project.

A feasibility study of a project 'Energetics of Biochemical and Living Cellular Systems: Compiliation of Thermodynamic Data' is being carried out by the Steering Committee on Biophysical Chemistry with Prof Ingmar Wadsö as coordinator. Wadsö presented the project at the meeting and expressed his view that the project is best carried out within Commission I.2 which has the competence needed for critical compilations of thermodynamic data. The Commission members felt that this could be best achieved by a Subcommittee on Thermodynamic Data, the creation of which could be proposed at the General Assembly in Lisbon(1993). The Steering Committee could provide names of persons suitable and willing to become subcommittee members. Wadsö was encouraged to prepare a report for Lisbon along these lines with recommendations for a first project for the subcommittee to start with.

A project proposal on 'Nomenclature for Phase Diagrams with Particular Reference to Vapour–Liquid and Liquid–Liquid Equilibria' prepared by T. W. de Loos was approved by the Commission. The formal decision will be made during the next meeting in Lisbon.

J. H. Dymond reported on a feasibility study for a project to develop a 'Set of Criteria for the Publication of Equations of State'. The aim of the project is to provide a set of practical guidelines for authors, editors, and reviewers of papers which present new types of equations of state for pure fluids and mixtures.

Dymond was asked to go ahead with the planning and to prepare a project proposal for the meeting in Lisbon.

The report of an extensive feasibility study of a project on 'The Theory of Equations of State' carried out by R. F. Kayser, C. J. Peters and J. V. Sengers was discussed at the meeting. The Commission approved the project and proposed that a committee with Sengers as chairman should prepare a project proposal for Lisbon. The committee should define the scope of the volume, identify authors, and contact Blackwell Scientific Publications about the possible publication of the project in the form of a book in the Experimental Thermodynamics series.

The next meeting will be held in Lisbon, Portugal, on 6–8 August 1993.

Dr Gerd Olofsson

New inorganic materials projects

The Commission on High Temperature and Solid State Chemistry (II.3) held a 1-day workshop on ceramics following its annual two day meeting held in Rome during September last year.

The focus of these meetings was the development of new IUPAC projects in the area of inorganic materials. The identification of appropriate new projects was facilitated by the participation of additional experts and of representatives from the Coordinating Committee for the Chemistry and Advanced Materials Programme (CCCAMP) in the workshop,

The workshop led to the formation of four preliminary survey teams charged with defining approaches to new projects on:

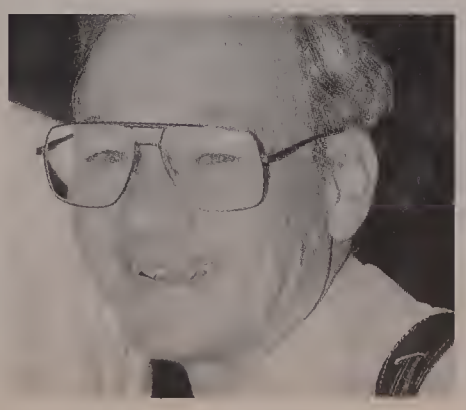
- high-temperature chemistry in ceramics processing.
- thermochemical and thermophysical properties of refractory metal carbides.
- standardization of electron probe microanalysis measurements on insulating materials;
- surface analysis of ceramics.

Each survey team will consult on the value and nature of the project with outside experts and develop an explicit plan for implementation to be brought to the 1993 meeting at the General Assembly in Lisbon. Commission II.3 and CCCAMP will also explore the need for IUPAC projects in the areas of clusters, manganese oxide nomenclature, perovskites, and ceramic fibres.

In other business, the commission received reports on draft manuscripts that are ready for, or already started through, the appropriate formal publication path:

- the teaching of solid state chemistry;
- the nomenclature of graphite interacalation compounds;
- an extensive list of terms defining recommended terminology for carbon;
- a list of terms concerned with phase transitions;
- two publications on solid state ionics describing the conclusions of a collaborative experimental project on ionic conductivity of fluorite structured oxides.

The commission also discussed plans for a newly established working party on fullerene nomenclature and terminology; a new subcommittee on the characterization of carbonaceous materials and new carbons; a database on high-temperature thermochemical properties of the elements. The dissemination of such a database under IUPAC auspices raises copyright policy issues that need to be resolved in the Union. The commission also discussed plans for a new project on the calculation of the equilibrium properties of high-temperature superconductors.



Gerd Rosenblatt is Secretary of Commission II.3.

The commission received reports on other ongoing projects concerned with: Characterization of SiC powers; the IUPAC High-temperature bibliography; Terminology for the kinetics of solid state reactions; and High-temperature mass-spectrometry ionization cross-sections.

The commission will sponsor the 8th International Conference of High-Temperature Materials Chemistry in Vienna, on 5–8 April 1994.

The next meeting of Commission II.3 will take place at the 37th IUPAC General Assembly in Lisbon, Portugal, on 6–8 August 1993.

Dr Gerd M. Rosenblatt

Commission V.2 in Cordoba.

Microchemical techniques and trace analysis

The Commission on Microchemical Techniques and Trace Analysis (V.2) held its 1992 meeting in Cordoba, Spain. In addition to a meeting of the Commission, the Working Group on Organic Trace Analysis and the Working Group on Speciation of Trace Elements also held meetings. Dr Rita Cornelius, Chairman of the Commission on Toxicology, also attended this meeting to coordinate work on speciation with Commission V.2.

Four Commission projects have been published in *Pure Appl. Chem.* since the previous Commission meeting and good progress has been made on a number of projects which were reviewed at this meeting.

The Commission's major new thrust on quality assurance of trace analytical measurements is making very good progress with its first five projects, and the first drafts of these are expected at the General Assembly in Lisbon.

One of the important parts of the programme of the Working Group on Organic Trace Analysis is trace analyses relating to the environment, and the Commission continues its contribution to the IUPAC horizontal programme on environmental chemistry through the efforts of this Working Group and the new Working Group on Quality Assurance. The Commission is also continuing work in the analytically important area of surface analysis and a newly focused programme for this work is expected at the General Assembly.

The next meeting will be held in Lisbon, Portugal, on 6–8 August 1993.

Dr David Westmoreland

Pesticide use in South East Asia

A successful 3-day Workshop on Assessment and Management of Risks from Pesticide use in South East Asia was held in Bangkok, Thailand, on 5–11 November 1992. The workshop was jointly organized by the Commission on Agrochemicals (VI.5), the Thailand Department of Agriculture and the Thai Pesticides Association (TPA). Funding was supplied by the IUPAC Chemistry and the Environment Programme, the International Council of Scientific Unions (ICSU) and the TPA.

Attendance included 20 IUPAC members, 16 regional scientists (some sponsored by IUPAC) and about 70 Thais representing government, industry and the universities.

The programme consisted of 35 spoken presentations plus some practical demonstrations of computer modelling and ELISA techniques for residue analysis. A book of abstracts was published. IUPAC provided authorative reviews in a range of areas of pesticide science.

The regional and Thai presentations concentrated on the issues arising from the sincere desire of governments and industry in the region to implement improved pesticide management practices. Priority areas where progress was being made were identified including improving worker safety (restrictions on older high toxicity products, improved labelling and training), more emphasis on Integrated Pest Management (control of resistance, reduced environmental impact of pesticides) and more monitoring of residues in food and the agricultural environment.

The pressures arising from the need to intensify agricultural production on more marginal land were recognized. The workshop concluded with a 1-day field trip which included observation of typical spraying of a horticultural crop. This demonstrated the problems of ensuring worker and environmental safety under conditions of tropical agriculture.

The even-year meeting of the Commission on Agrochemicals was held immediately prior to the workshop. Three projects were completed and are being published in *Pure Appl. Chem.*: 'Use of mammalian cells in metabolism studies on agrochemicals'; 'The fate of agrochemicals in soil-plant systems – a cost-effective integrated approach'; and 'Detection and significance of biologically activated metabolites of agrochemicals in animals and man'.

A further two projects were progressed to near completion: 'The effects of storage and processing on pesticide residues in food'; and 'Off-site transport of pesticides in the aqueous phase – mathematical models for leaching and run-off'.

A number of other projects were initiated or developed for future work. A glossary of terms for agrochemistry has been compiled. Progress was discussed on the organization of the 8th IUPAC Congress on Pesticide to be held in Washington DC, USA, on 4–9 July 1994.

The next meeting of the Commission will be at the Lisbon General Assembly, on 6–8 August 1993.

Patrick Holland

A project on 'Detection and significance of biologically activated metabolites of agrochemicals in animals and man' is one of several projects recently completed by the Commission on Agrochemicals. (*FAO photo by F. Paladini*)

Names and Addresses

Full details (names, addresses, telephone/telex/fax numbers) of commission and committee chairmen and secretaries and IUPAC officers were published in *Chem. Intl.* **13**, 223–233 (1991). The IUPAC Secretariat has been notified recently of the following change:

Prof. John Corish (Chairman, Commission on High Temperature and Solid State Chemistry). Tel. +353 (1) 7021726.

Prof. Henri Favre (Chairman, Commission on Nomenclature of Organic Chemistry). Tel. +1 (514) 343 56516.

Prof. K. G. Heumann (Chairman, Commission on Atomic Weights and Isotopic Abundances). Fax +49 (941) 19434447.

Prof. Nelson Leonard (President, Organic Chemistry Division). Mail Code 164-30, California Institute of Technology, Pasadena, CA 91105, USA. Tel. +1 (818) 356 6199. Fax +1 (818) 564 9297.

Dr Junshi Miyamoto (Vice-President, Applied Chemistry Division). Sumitomo Chemical Co., Ltd, 4-5-33, Kitahama, Chuo-ku, Osaka, Japan. Tel. +81 (6) 220-3152. Fax +81 (6) 220-3350.

Dr Henrik Olesen (Chairman, Commission on Quantities and Units in Clinical Chemistry). Tel. +45 (35) 45 76 87.

Dr Willie Peijnenburg (Secretary, Commission on Water Chemistry). Fax +31 (30) 291365.

Dr Albert Pohland (Chairman, Commission on Food Chemistry). Tel: +1 (202) 205 8692. Fax: +1 (202) 205 4422.

Dr Klára Tóth (Secretary, Commission on Electroanalytical Chemistry). Tel. +36 (1) 166 4011 ×2273. E-mail: h4468TOT9 ella.hun.

Prof. Dennis Tuck (Chairman, Commission on Equilibrium Data). Fax +1 (519) 973 7098. E-mail: TA2 @ UCC U WINDSOR. CA.

Prof. Peter Warneck (Secretary, Commission on Atmospheric Chemistry). Max-Planck-Institut für Chemie, Saarstr., 23, D-6500 Mainz, Germany. Fax +49 (6131)

Destruction of chemical warfare agents

The first meeting of the IUPAC Task Force on Scientific Aspects of the Destruction of Chemical Warfare Agents was held on 22–24 February 1993. Experts from France, Germany, Italy, Poland, Russia, UK and USA attended the meeting which was hosted by the Chemical and Biological Defence Establishment (CBDE), Portion Down, near Salisbury, UK. The meeting was co-chaired by Prof. Joseph Bunnett (University of California, USA) and Mr Ron Manley (CBDE).

The Task Force is seeking to:

- identify scientific questions related to the destruction of chemical warfare agents that need further investigation by research;
- obtain and disseminate information about potential destruction processes.

It aims to help authorities faced with chemical munitions destruction problems. The work of the Task Force will include site visits to mustard and nerve gas 'warehouses', to existing installations used for their destruction, and to pilot plants of similar purpose.

A Task Force Information Statement will be published in the July 1993 issue of *Chemistry International*. The main report of the Task Force will eventually be published in *Pure and Applied Chemistry*.

Conferences

Organosilicon chemistry Poznan, Poland 15–20 August 1993

IUPAC SPONSORED

The 10th International Symposium on Organosilicon Chemistry will be held at the Adam Mickiewicz University, Poznan, Poland. Poznan is located 300 km west of Warsaw, the capital of Poland, and is readily accessible by road, rail and air.

The official language of the symposium will be English.

The major topics of the symposium will be:

1 Organic chemistry of silicon: new reactions, new compounds.
2 Inorganic chemistry of silicon (Si–Si, Si–O, Si–N, Si–S, Si–P, Si–transition-metal).
3 Silicon polymers and oligomers.
4 Theoretical and structural chemistry of silicon.
5 Mechanistic organosilicon chemistry, reactive intermediates: (a) gas-phase and photochemical reactions; (b) liquid-phase transformation.
6 Bio- and environmental organosilicon chemistry.
7 Silicon in organic synthesis.
8 Silicon-based materials (polymers, ceramics).
9 Analysis of organosilicon compounds.

In addition to five plenary and 40 invited lectures given by leading scientists a limited number of contributions will be presented orally. Invited and contributed papers will be held in parallel sessions. Poster communications will be displayed with a minimum of 2 hours reserved specifically for their discussion. Special sessions devoted to history and perspectives or organosilicon chemistry will be organized.

The abstracts of the lectures and contributed papers will be published in the proceedings of the symposium. The full texts of the plenary and invited lectures will be issued after the symposium.

Heterocyclic chemistry
Antwerp, Belgium
1–6 August 1993

IUPAC SPONSORED

The 14th International Congress of Heterocyclic Chemistry (ICHC) will be held in Antwerp, Belgium at the RUCA location of the University of Antwerp, on 1–6 August 1993.

The scientific programme will include 11 plenary session lecturers and at least 30 invited lecturers. Six main topics in the vast area of heterocyclic chemistry will be covered in parallel sessions. There will be one additional session for miscellaneous subjects. The symposium topics are:

1. Heterocyclic drugs and agrochemicals
2. Macrocycles
3. Nucleosides and nucleotides
4. Heterocyclic dyes
5. New methods of heterocyclic synthesis
6. S-, Se- and Te-heterocycles.

Each of these symposia will be run by a coordinator and five or six invited lecturers who will introduce each session with main lectures preceding the oral communications.

The plenary sessions will include the following lectures:

- Site-specific recognition of DNA by transition metal complexes (J. K. Barton, USA).
- Proton transfer in solid heterocycles: an X-ray and CP/MAS study (J. Elguero, Spain).
- Heterocycle synthesis by palladium catalysed cyclization-anion capture processes: a powerful new strategy (R. Grigg, UK).
- The versatile chemistry of thiophene (S. Gronowitz, Sweden)
- Stereoselectivity during cycloadditions leading to novel heterocycles (A. Hassner, Israel)
- Synthesis of bioactive nitrogen heterocycles from marine organisms (T. Hino, Japan)
- Quinazoline inhibitors of thymidylate synthase: potent new anticancer agents (P. Marsham, UK)
- Strategies for the synthesis of heterocyclic natural products (S. Martin, USA)
- Synthetic studies directed to the novel anti-tumor alkaloids sesbanamide and manzamine A (U. Pandit, The Netherlands)
- Phosphaalkynes - New building blocks in heterocyclic chemistry (M. Regitz, Germany)

The registration fees before/after 1st May are BEF 9000/10 000 or BEF 8000/9000 for ISHC and IUPAC members including affiliates. Accommodation will be available in hotels at rates for single rooms ranging from BEF 2000 to BEF 7150.

Before, during and after the congress participants will have ample opportunity to discover the numerous vestiges of the great past of this part of Europe as well as its contemporary achievements, all of which will certainly tempt them to prolong their stay in Belgium.

Belgium has played a significant role in the development of modern chemistry and chemical processing. The relatively dense concentration of chemical industries and research laboratories still bears witness to this tradition. Many of these are situated in the region around Antwerp. This cosmopolitan city is the world's fifth largest port and about one-third of the world's diamond trade passes through it.

The site of the congress is situated south of the city, close to a network of highways and Brussels International Airport is only 50 km away.

The climate in Belgium in August is temperate. There may be nice summer spells with temperatures between 20 and 30°C. Rain is possible.

Applications of the Mössbauer Effect
Vancouver, Canada
8–14 August 1993

IUPAC SPONSORED

The 1993 International Conference on the Applications of the Mössbauer Effect – the latest in three decades of ICAME conferences will take place on the campus of the University of British Columbia, Vancouver, Canada, on 8–14 August. ICAME '93 will celebrate the 35th anniversary of Rudolph L. Mössbauer's initial publication.

From left: Profs T. Alderweireldt, E. Esmans and J. Schrooten, respectively 14th ICHC Chairman, Vice-Chairman and Secretary.

The scientific programme of ICAME '93 will cover:

- Chemistry, chemical structure and bonding;
- Mineralogy, geology, archeology;
- Biology, biophysics, medical applications;
- Metallurgy, materials science and engineering;
- Fundamental physics, interference, coherence, time reversal, synchrotron studies;
- General theory;
- Methodology, experimental techniques, data processing;
- Surfaces, interfaces, epitaxy, thin films and coatings;
- Point defects, clusters, dilute systems, low-dimensional systems, small particles;
- Lattice dynamics, diffusion;
- Phase transitions, valence fluctuations, relaxation, aftereffects;
- Ion implantation, ion beam mixing, laser and ion beam surface modification, radiation damage;
- Superconductivity;
- Catalysis, corrosion, tribology;
- Magnetism and magnetic materials;
- Amorphous materials, quasicrystals, nanocrystalline materials;
- Metal and alloys;
- Semiconductors, electronic and optical materials.

The following scientists have accepted invitations to speak at the conference:

Eckhard Bill: High oxidation states of iron in biological and biomimetica systems: complementary Mössbauer, EPR, and susceptibility studies;
J. M. D. Coey: Interstitial intermetallics;
E. A. Ferrow: Mössbauer effect and TEM in mineralogy;
Richard Frankel: Magnetic particles in magnetoactive bacteria and other organisms;
James Hannon: Coherent excitations of nuclei by synchrotron radiation pulses;
A. Hauser: Intersystem crossing in Fe(II) coordination compounds;
J. A. Hodges: Rare earth in high T_c superconductors;
E. Kankeleit: A Mössbauer experiment on Mars;
Gerard Le Caer: Mechanosynthesis of nanocrystalline materials;
Catherine McCammon: Mineralogical applications of the Mössbauer milliprobe;
Saburo Nasu: High-pressure Mössbauer effect and collective motions in glass-forming liquids and polymeric networks;
Q. A. Pankfurst: The magnetism of fine particle oxides and oxyhydroxides in applied fields;
Rudolf Rüffer: Nucler diffraction with synchrotron radiation;
Z. M. Stadnik: Mössbauer spectroscopy of quasicrystals.

In a special commemorative session, several pioneers of Mössbauer research will present lectures:

Rudolph Mössbauer	Early reminiscences on the discovery of recoilless resonance radiation.
Hans Frauenfelder	Mössbauer effect and biological physics.
Vitalii Gol'danskii	Mössbauer effect and Rudolph personally entering the Khruschev thaw.
Stanley Hanna	The Early Iron Age.
Charles Johnson	Mössbauer effect and magnetism.

Vancouver Island.

A special workshop on Mössbauer Synchroton Radiation Research, organized by Gena Smirnov, will be held on Tuesday evening.

The Proceedings of ICAME '93, including invited papers and accepted contributed papers, with be published as special volumes of *Hyperfine Interactions*. Publication is scheduled for May 1994.

The registration fees before/after 1 June are: for regular participants CAD 225/325; accompanying persons CAD 120/170 and graduate students CAD 100/150. IUPAC affiliates are entitled to a 10% discount on the full fee.

Accommodation is available at the Walter Gage Complex on the UBC campus at rates ranging from CAD 29 to CAD 80 per night.

Social events include an informal mixer, reception, conference trip including cruise and dinner and conference banquet.

A number of satellite conferences are also being held in August 1993: 16th International Conference on Photochemistry at the University of British Columbia (1–6 August); International Conference on Low-Temperature Physics at the University of Oregon (4–10 August); 9th International Conference on Fourier Transform Spectroscopy at the University of Calgary, Alberta (23–27 August).

Vancouver, with its 1.5 million residents, has a diverse blend of cultures and attractions and is described as one of the world's most beautiful cities. Warmed by an off-shore current and protected by its coastal mountain range, Vancouver enjoys an average temperature in the mid-20s °C in August with nightly temperatures about 12°C.

Solution chemistry Leicester, UK 15–21 August 1993

IUPAC SPONSORED

The 23rd International Conference on Solution Chemistry will be held in Leicester University, UK, on 15–21 August 1993. This IUPAC-sponsored conference is being organized in association with the Royal Society of Chemistry and Leicester Polytechnic.

Participants will gather on Sunday 15 August for dinner and reception. The scientific programme is timetabled for 16–21 August followed by a post-conference tour on 22 August.

The scientific programme will cover a range of physical, inorganic, organic and theoretical aspects of solution chemistry, arranged around the following four main themes:

- Solute–solvent interactions studies using thermodynamics, spectroscopy and kinetics.
- Role of solvent in biological processes.
- Micelles, microemulsions and other organized media.
- Solutions under extreme conditions.

The official language of the conference will be English. No translation facilities will be provided. Abstracts of contributed papers and posters will be published in the Conference Proceedings. Plenary and invited lectures will be published in *Pure Appl. Chem.*

The plenary lecturers are:

Ezio Pelizzetti (Universita di Torino): Non-ideal effects on chemical equilibria and partitioning in organized assemblies;

Brian Robinson (University of East Englia): Structure and reactivity in microemulsions;

Rudi van Eldik (University Witten/Herdecke): *ICI Plenary Lecture* – Pressure as a kinetic parameter in mechanistic studies of chemical reactions by flash photolysis and pulse radiolysis;

Christian Reichardt (Philipps-Universität, Marburg): *UNICAM Plenary Lecture* – Solute–solvent interactions and their empirical determination by means of solvatochromic dyes;

George W. Neilson (University of Bristol): *Leicester Polytechnic Plenary Lecture* – Ion-solvent structure in electrolyte solutions;

Cornelius Van den Berg (Wageningen University): Behaviour of concentrated aqueous carbohydrate systems at low temperatures; Freeze-dried structures and glass transitions;

John I. Finney (SERC Rutherford): Water perturbation in real and model biological systems: recent results from neutron scattering;

Peter A. Kollman (University of California): *Glaxo Plenary Lecture* – Free energy calculations on small and large molecules;

Herman J. C. Berendsen (University of Groningen): *Pfizer Plenary Lecture* – Molecular dynamics simulation of water transport through membranes: water from solvent to solute.

Tiong-Koon Lim (University of Malaya): *The R. A. Robinson Memorial Lecture 1993* - The calculation of activity coefficients of binary mixed electrolytes.

The scientific programme will also include contributed papers and a poster session as well as the following invited lecturers: Chris Dobson (University of Oxford); Manfred Holz (University of Karlsruhe); Hitoshi Ohtaki (University of Okazaki); M. Abraham (University College London); T. Lilley (University of Sheffield).

The main accommodation base for the conference will be Beaumont Hall which adjoins the University's Botanic Gardens. The conference lectures and seminars will take place in Gilbert Murray Hall which is 2 minutes' walk from Beaumont Hall.

The conference fee will be approximately GBP 125 to which Value Added Tax (currently 17.5%) will be added. A reduction of 10% will be made for IUPAC members. There will also be a reduced registration fee for students and accompanying person. Accommodation costs are expected to be in the region of GBP 33 per day (+VAT) which includes bed and breakfast, lunch and evening meal but excludes the conference dinner.

A full programme of social events is planned with the afternoon and evening of Wednesday 18 August being set aside for a free organized excursion to Warwick Castle. A post-conference tour will be arranged to the Iron Gorge Museums (birthplace of the industrial revolution). This full-day tour will encompass the Iron Bridge itself (built in 1779) and 'a taste of life in 18th century rural England'.

Leicester has a long and varied history, due largely to its central position in the economic life of the country. Founded as Roman settlement, Leicester was successively settled and developed by Saxons, Danes and Normans. By the 18th century, Leicester was developing as a manufacturing centre, chiefly in the field of hosiery and knitting. The University was founded as a university college in the early part of this century. Students were first admitted in 1921 reading external degrees for London University. A rapid period of growth after the Second World War culminated in the granting of its Charter and authority to award its own degrees in 1957.

Leicester is easily accessible by air, train (75 minutes from London or 60 minutes from Birmingam), road and bus. The most convenient airports are London Healthrow, Gatwick, Stansted and Birmingham.

Macromolecule–metal complexes
Bremen, Germany
30 August – 3 September 1993

IUPAC SPONSORED

The 5th International Symposium on Macromolecule–Metal Complexes (MMC V) will be held at Universität Bremen, Bibliothekstr., Hörsaalgebäude, 2800 Bremen 33, Germany, from 30 August to 3 September. MMC V will be the latest in a series of international symposia held in China, Japan, USA, and Italy devoted to fundamental and applied research in the rapidly expanding interdisciplinary field of macromolecular metal complexes.

Macromolecular–metal complexes are found widely in nature, for example, they are used in visible light energy conversion (photosynthesis), catalysis (metallo-enzymes), and selective gas transport (haemoglobin). The investigation of the structure and function of these complexes is an important field of research. No system designed by scientists has the complexity of functionality of natural systems.

The preparative design of macromolecular metal complexes focuses on the sythesis of:

1 metal-ions or metal–metal clusters and metal-ion–metal-ligands in organic and inorganic poymers;

2 covalent and coordinate bonding of metal-ion–metal-ligand complexes on a macromolecular chain;

3 metal-ion–metal-ligand complexes as part of a polymer chain or network.

A related field is concerned with metal-ion–metal-ligand binding on the surface of inorganic supports or inclusion in organized media (molecular sieves, clays, etc). Research is also being carried out on intermolecular complexes and molecular complexes between macromolecules and small organic guest molecules.

The characteristic properties and applications of macromolecular metal complexes are summarized in the Table.

Properties	Applications
selectivity	gas transport, separation, sensors
mixed valence systems	multi-electron transfer, catalysis, artificial photosynthesis, electrochemistry
solid-state photon interactions	photovoltaic cell, photo-electrochemistry
electron/photoelectron conduction	molecular devices, photo conductors, lasergraphy
ionic conduction	ECD devices, superconductors, polymer batteries
non-linear optical effects	modulars, integrated optics, high-power lasers
therapeutic effect	drugs, photodrugs
preceramics	thermally stable compounds, quantum devices

The symposium will consist of invited lectures, poster contributions, discussions as well as social events including a welcome cocktail, conference dinner and excursion. The offical lanaguage of the symposium is English. No translation facilities will be available.

The main topics and lectures of the symposium are:

Fundamental aspects of macromolecule–metal complexes (synthesis, structure, properties, function)

F. Ciardelli (Universita di Pisa): Synthesis and structure of metal complexes with organic polymers and with inorganic supports.

J. H. Fuhrhop (Freie Universität Berlin): Micellar fibers made of amphilic porphyrins.

G. A. Ozin (University of Toronto): Macromolecular zeolite–metal complexes – a coordination view of metal–ligand bonding in zeolite guest-host inclusion compounds.

A. Rusanov (Russian Academy of Sciences, Moscow): Formation, characterization and catalytic activity of Pd-polyheteroarylene complexes.

Related biological systems and medical aspects

B. M. Culbertson (Ohio State University, Columbus): Polymer–metal complexes in biomedical applications – Concepts and Trends.

R. Huber (Max-Planck-Institut für Biochemie, Martinsried bei Muenchen): Annexins, calcium bindings and ion channel properties.

E. W. Neuse (University of Witwatersrand, Johannesburg): Macromolecular metal compounds in cancer research; concepts and synthetic approaches.

J. Reedijk (Leiden-University): Metal coordination of natural macromolecules.

Catalysis and separation processes

M. R. Callstrom (Ohio State University, Columbus) Nanoscale Pt(O)-clusters in glassy carbon and catalytic activity.

A. A. Efendiev (Azerbaijan Academy of Sciences, Sumgait): Complexing polymer sorbents and metal polymer catalysts with specially designed structure of active clusters.

Y. -Y. Jiang (Academia Sinica, Beijing): New polymer–metal complex catalysts.

P. A. Jacobs (Katholieke Univerity Leuven, Heverlee): a critical overview of the catalytic potential of zeolite-encaged metallo-complexes.

P. W. N. M. van Leeuwen (Koninklijke Shell Laboratory, Amsterdam): Hydroformylation with polymer bound rhodium-triogranylphosphit catalysts.

E. A. Karahanov (Moscow University): Polymer bound Pd and Rh complexes as catalysts for hydroformylation and carbonylation.

H. Nishide (Waseda University, Tokyo): O_2/N_2-separation by polymeric cobalt complexes.

C. -Y Pan University of Science and Technology, Hefei, Anhui): Hydroformylation catalysed by polymer-supported metal complexes.

B. V. Romanovsky (Moscow State University): Transition metal complexes in inorganic polymers as enzyme mimics.

D. I. Sherrington (University of Strathclyde, Glasgow): Polymer-supported Mo(VI) and Pd(II) alkene oxidation catalysts.

Electron and photon induced processes

M. Hanack (Universität Tübingen): Conduction in polymeric macrocyclic complexes.

A. R. Hillmann (Leicester University): Electrochemical quartz crystal microbalance studies of redox polymer films.

K. Horie (Tokyo University): Photochemical hole burning in macromolecular complexes.

K. Mizoguchi (Functional Organic Research Laboratory, NEC, Kawasaki): Macromolecular complexes for advanced optoelectronic devices.

Noboru Oyama (Tokyo University of Agriculture & Technology): *in situ*/dynamic analysis on electron-transfer in macromolecular–metal complexes.

The conference fees are (before/after 31 May) DEM 300/350 and for participants DEM 100/150 for students.

Euroanalysis VIII
Edinburgh, UK
5–11 September 1993

IUPAC SPONSORED

The 8th European Conference on Analytical Chemistry, EUROANALYSIS VIII, will be held at the University of Edinburgh in Scotland's beautiful and historic capital city.

The conference will cover developments in instrumentation and methodology in all areas of analytical chemistry, with emphasis on industrial, pharmaceutical, biomedical and environmental analysis. Sessions on Computer Based Analytical Chemistry (COBAC) and Validity in Analytical

The opening ceremony and poster paper sessions of Euroanalysis VIII will take place in the McEwan Hall in Edinburgh.

Measurements (VAM) will also be featured. The programme will be designed to appeal both to practising analytical chemists in industry and to those in academia who are teaching and doing resesarch. The programme will consist of invited keynote lectures and contributed oral papers in 5 parallel streams. There will also be extensive poster paper sessions and an exhibition of books and journals. The conference language will be English.

All invited lectures will be published in a collected volume as the Proceedings of the Conference in the series *Reviews on Analytical Chemistry*. Manuscripts of accepted contributed papers, which satisfy the normal criteria and are submitted by the end of October 1993, will be considered for publication in journals of the Royal Society of Chemistry.

A comprehensive social programme is being planned for participants and accompanying persons. It will include half- and full-day excursions and various evening events including a whisky tasting and a buffet reception at the Royal Museum of Scotland.

The approximate cost of registration (including book of abstracts, the volume of proceedings, refreshments and some receptions, but excluding accommodation, meals and much of the social programme) is GBP 250 for members of FECS societies and IUPAC affiliate members, GBP 325 for non-members and GBP 55 for retired members of FECS societies and *bona fide* full-time students. A 2-day registration is available at GBP 170 for members of FECS societies and IUPAC affiliate members and GBP 220 for nonmembers.

Accommodation has been arranged at the University of Edinburgh, but participants can make their own arrangements if they wish to stay in local hotels. Edinburgh has an international airport and there is a frequent train service from London. Parking facilities are available at the Halls of Residence at the University.

The conference immediately follows the world renowned Edinburgh Festival, which will be held from 15 August to 4 September 1993.

Organometallic chemistry Kobe, Japan 19–23 September 1993

IUPAC SPONSORED

The 7th International Symposium on Organometallic Chemistry directed towards Organic Synthesis (OMCOS 7) will be held in Kobe, Japan, on 19–23 September 1993 under the auspices of IUPAC and the Kinki Chemical Society, Japan. The symposium will take place at the Kobe International Conference Center located on Port Island facing the Inland Sea. This symposium follows the previous successful OMCOS meetings at Fort Collins (1981), Dijon (1983), Kyoto (1985), Vancouver (1987), Florence (1989), and Utrecht (1991).

The official language of the symposium will be English.

The symposium aims to present recent results and to enable the discussion of trends and exchange of ideas relating to the use of metals in organic sythesis. Topics to be included are:

- Synthesis of molecules of biological interest via organometallics.
- Metallo-enzymes in organic synthesis.
- Synthesis of fine chemicals via organometallics.
- Selective synthetic processes mediated by organometallic compounds.
- Structure–reactivity relationships of organometallic reagents and intermediates.

The plenary and invited lectures will be published in *Pure Appl. Chem.* The following scientists have accepted invitations to present lectures with the following provisional titles:

Steven V. Ley (University of Cambridge, UK): Tricarbonyliron lactone complexes in organic synthesis.

Larry E. Overman (University of California, Irvine, USA): New organometallic strategies for preparing polycyclic ring systems.

Hideki Sakurai (Tohoku University, Japan): An approach to stable organic molecules of the triplet state via organosilicon route.

Manfred Schlosser (Université de Lausanne, Switzerland): Site selective hydrogen/metal exchange: competition and cooperation between superbases and neighboring groups.

Richard R. Schrock (Massachusetts Institute of Technology, USA): Recent advances in the chemistry and applications of high oxidation state alkylidene complexes.

K. Barry Sharpless (The Scripps Research Institute, USA): Recent advances in asymmetric catalysis.

Gerard van Koten (University of Utrecht, the Netherlands): Stereoselective conversions with zinc and copper complexes of enolates and thiolates.

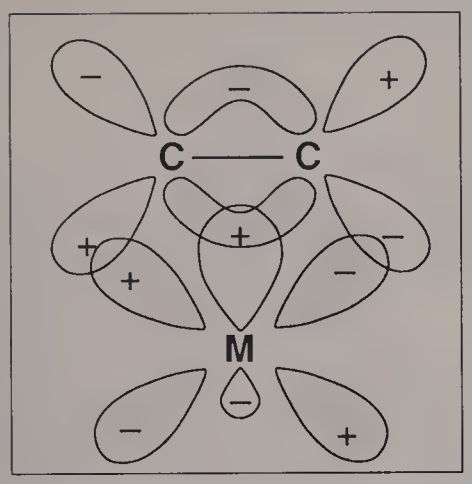
In addition the scientific program will include 15 invited lectures together with short lectures and posters sessions.

The social programme will include a welcome get-together, a reception and a banquet. Accommodation will be available in local hotels ranging in price from JPY 6 200 to JPY 13 750 per day (single). The registration fees are (before/after 15 June 1993):

JPY 40 000/45 000 for active participants;

JPY 15 000/20 000 for junior scientists (undergraduates and graduate students; postdoctoral fellows) and

JPY 10 000/15 000 for accompanying persons.



IUPAC affiliates are entitled to a 10% reduction.

Kobe is located between the Rokko Mountains and the Seto Inland Sea. Over a 15-year period the artificial Port Island was developed by moving some of the mountainside to reclaim a 436-hectare area from the sea. The Kobe Convention Center on Port Island, consists of a convention hall, multipurpose and exhibition halls as well as first-class hotels.

During the period of the symposium the climate in Kobe is likely to be warm, with the temperature ranging from 19°C at night to 27°C during the day.

Arctic and marine oilspill

Environment Canada's 16th Arctic and Marine Oilspill Program (AMOP) Technical Seminar will be held at the Westin Hotel in Calgary, Alberta, Canada, on 7–9 June 1993. The AMOP Seminar will feature technical papers on cold region oilspill programs.

Topics will include: **1** Physical and chemical properties, and behaviour of spilled oil; **2** Biological effects of oil and hydrocarbons; **3** Countermeasures for oil spills – (a) containment and recovery, (b) oilspill treating agents, (c) combustion and incineration; **4** Shoreline protection and clean-up; **5** Detection, tracking and remote sensing; **6** Activity updates; **7** Recent spill experiences.

Further information from: Susan Clarke, Seminar Coordinator, Technology Development Branch, Environmental Protection, Unit 100, Asticou Centre, 241 Cité des Jeunes Blvd., Hull, Quebec, Canada I1A OH3. Tel: +1 (819) 953-5227. Fax: +1 (819) 953-9029.

Organic chemistry

The 8th European Symposium on Organic Chemistry will be held from Sunday 29 August to Friday 3 September 1993 in a hotel in the Olympic Village, Baracelona, Spain. The meeting will consist of 14 plenary lectures, 6 invited lectures, oral communications and poster sessions organized in 3 main sections (synthetic, physical and biological organic chemistry).

For further information please contact: Prof. Josep Font, Departament de Quìmica, Universitat Autónoma de Barcelona, E-08193 Bellaterra, Spain. Fax: +34 (3) 581 2003/ 1614.

Research in chemical education

The 2nd European Conference on Research in Chemical Education (2nd ECRICE), will be held at the Dipartimento di Chimica e Chimica Industriale, Unversità degli Studi di Pisa, Italy, on 11–14 September 1993. The conference is organized by the Working Party on Chemical Education of the Federation of European Chemical Societies in collaboration with the Education Division of the Italian Chemical Society. The aims of the conference focus on: evaluation; trends in didactics, problem solving, experimental teaching, computer-assisted teaching, and chemistry and the environment. The specific objectives are:

- to describe the state of chemical education research and to help chemists develop this research;
- to develop European cooperation for the promotion of chemistry teaching;
- to promote interest in chemical education research;
- to involve more and more chemists in this research;
- to improve chemistry teaching;
- to identify priorities.

The languages of the conference will be English and Italian.

For further information please write to: "2° Congresso Europeo sulla Ricerca in Didattica della Chemica", Dipartimento di Chimica e Chimica Industriale dell' Università di Pisa, Via Risorgimento 35, 56126 Pisa, Italy.

Chiral discrimination

The 4th International Symposium on Chiral Discrimination will be held in Montreal, Canada, on 19–22 September 1993. The symposium will provide a forum for the exchange of ideas and information concerning all aspects of the impact of chirality on biology, pharmacology and chemistry.

For further information please contact: Chiral Secretariat, Conference Office, McGill University, 550 Sherbrooke Street West, West Tower, Suite 490, Montreal, Quebec, Canada H3A 1B9. Tel: +1 (514) 398 3770. Fax: +1 (514) 398 4854.

Spectroscopy of biological molecules

The 5th European Conference on the Spectroscopy of Biological Molecules will take place at Club Poseidon, Loutraki, Greece, on 5–10 September 1993. The conference will focus mainly on the structure and dynamics of biological and related systems as determined from Raman and IR spectroscopic methods. However, it will also provide a critically comparative review of recent progress in this field as achieved through the application of other methods particularly, NMR, CD, optical absorption and fluorescence, X-ray cryatallography and neutron scattering.

For further details contact: Prof. Theo Theophanides, Chairman of ECSBM '93, Department of Chemical Engineering, National Technical University of Athens, Zografou Campus, Zografou 15780, Athens, Greece. Tel. +30 (1) 7792438, 724227, 7728114. Fax: +30 (1) 7700989.

Conference Calendar

Conference circulars and registrations forms for the IUPAC-sponsored conferences listed below may be obtained, upon request, from the names and addresses shown in italics.

1993

Characterization of porous solids

9–12 May.
3rd International Symposium on Characterization of Porous Solids (COP-111). Marseille, France.
Prof. J. Rouquerol, Centre de Thermodynamique et de Micro-calorimetrie du CNRS, 26 rue du 141 ème RIA, 13003 Marseille, France.

Environment and analysis

11–13 May.
International Environment 93 and Analysis 93.
London, UK.
Mr M. L. Richardson, BASIC, 6 Birch Drive, Maple Cross, Rickmansworth, Hertfordshire WD3 2UL, UK.

Safety in chemical production

31 May–4 June.
2nd IUPAC Workshop on Safety in Chemical Production.
Yokohama, Japan.
Prof. K. Tamaru, Japan IUPAC Workshop Committee, c/o The Chemical Society of Japan, 1-5 Kanda-Surugadai, Chiyoda-ku, Tokyo 101, Japan. Tel: +81 (3) 3292-6161. Fax: +81 (3) 3292-6318. Telex: 02226198 CSJ J.

Bioorganic chemistry

6–10 June.
2nd International Symposium on Bioorganic Chemistry.
Fukuoaka, Japan.
Symposium Secretariat, 2nd International Symposium on Bioorganic Chemistry, Department of Chemical Science and Technology, Faculty of Engineering, Kyushu University 36, Higashi-ku, Fukuoka 812, Japan. Fax: +81 (92) 6321842.

Carotenoids

20–25 June.
10th International Symposium on Carotenoids.
Trondheim, Norway.
10 Carotenoid Symposium, SEVU Conference Office, N-7034 Trondheim, Norway. Tel: +47 (7) 59 52 46 Fax: +47 (7) 51 72 26.

Multiphoton processes

24–30 June.
6th International Conference on Multiphoton Processes (ICOMP VI).
Québec, Canada.
Dr S. L. Chin, Faculté des Sciences et de Génie, Centre d'optique, photonique et laser, Université Laval, Paveillon Alexandre-Vachon, Cité universitaire, Québec, Canada GiK 7P4. Tel: 1 (418) 656-2454.

Visas

It is a condition of sponsorship that organizers of meetings under the auspices of IUPAC, in considering the locations of such meetings, should take all possible steps to ensure the freedom of all bona fide chemists from throughout the world to attend irrespective of race, religion, or political philosophy.

IUPAC sponsorship implies that entry visas will be granted to all bona fide chemists provided application is made not less than three months in advance. If a visa is not granted one month before the meeting the IUPAC Secretariat should be notified without delay by the applicant.

Macrocyclic chemistry

27 June – 2 July
18th International Symposium on Macrocyclic Chemistry.
Enschede, Netherlands.
Dr J. F. J. Engbersen, Department of Chemical Technology, University of Twente, P.O. Box 217, 7500 AE Enschede, The Netherlands. Tel: +31 (53) 892926. Fax: +31 (53) 356024.

Spectroscopy

29 June – 4 July
18th Colloquium Spectroscopicum Internationale.
York, UK.
XXVIII Colloquium Spectroscopicum Internationale, Department of Chemistry (CSI Secretariat), Loughborough University of Technology, Loughborough, Leicestershire, LE11 3TU.

Cationic polymerization

4–7 July
11th International Symposium on Cationic Polymerization and Related Ionic Processes.
Borovets, Bulgaria.
Dr I. V. Berlinova, Institute of Polymers, Bulgarian Academy of Sciences, 1113 Sofia, Bulgaria. Tel: +359 (2) 700138/7133663. Fax: +359 (2) 707523. Telex: 22729 echban bg.

Boron chemistry

11–15 July
8th International Meeting on Boron Chemistry (IMEBORON VIII), Tennessee, USA.
IMEBORON VIII, University of Tennessee Conference Center, PO Box 2468, Knoxville, TN 37901-2648, USA. Tel: +1 (615) 9740250. Fax: +1 (615) 9740268.

Washington: venu of the 5th International Symposium on Harmonizaton of Internal Quality Assurance Schemes for Analytical Laboratories.

Optics and dynamics of polymers

12–15 July
33rd Microsymposium on Macromolecules, Optics and Dynamics of Polymers.
Prague, Czechoslovakia.
33rd Microsymposium, P.M.M. Secretariat, c/o Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, 162 06 Prague 6, Czechoslovakia. Tel: +42 (2) 360317. Fax: +42 (2) 367981. Telex: 122019 IMCP C.

Fluorinated monomers and polymers

19–22 July
34th Microsymposium on Macromolecules, Fluorinated Monomers and Polymers.
Prague, Czechoslovakia.
34th Microsymposium, P.M.M. Secretariat, c/o Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, 162-06 Prague 6, Czechoslovakia. Tel: +42 (2) 360317. Fax: +42 (2) 367981. Telex: 122019 IMCP C.

Harmonization of internal quality assurance schemes

26–29 July
5th International Symposium on the Harmonization of Internal Quality Assurance Schemes for Analytical Laboratories.
Washington, DC, USA.
Dr Michael Parkany, ISO Central Secretariat, Case postale 56, CH-1211 Genève 20, Switzerland.

Heterocyclic chemistry

1–6 August
14th International Congress on Heterocyclic Chemistry.
Antwerp, Belgium.
Prof. F. C. Alderweireldt, Antwerp University, Groenenborgeriaan 171, B-2020 Antwerp, Belgium.

IUPAC General Assembly

5–12 August
37th IUPAC General Assembly.
Lisbon, Portugal.
The IUPAC General Assembly is not open for general participation but restricted to members of IUPAC bodies that meet on this occasion.

Mössbauer effect

8–14 August
International Conference on the Applications of the Mössbauer Effect.
Vancouver, Canada.
Prof. J. G. Stevens, Mössbauer Effect Data Center, University of North Carolina at Asheville, One University Heights, Asheville, NC 28804, USA.

IUPAC Congress

15–20 August
34th IUPAC Congress.
Beijing, China.
Prof. Xinqi Song, Secretary General of 34th IUPAC Congress, c/o Chinese Chemical Society, PO Box 2709, Beijing 100080, China. Tel: +86 (1) 2568157 or 2564020. Telex: 20035 CAST CN c/o CAST.

Organosilicon chemistry

15–20 August
10th International Symposium on Organosilicon Chemistry.
Poznan, Poland.
Xth International Symposium on Organosilicon Chemistry, Prof. B. Marciniec, Chairman of the Organizing Committee, Faculty of Chemistry, Adam Mickiewicz University, Grunwaldzka 6, 60-780 Poznan, Poland.

Solution chemistry

15–21 August
23rd International Conference on Solution Chemistry.
Leicester, UK.
Dr M. J. Blandamer, Department of Chemistry, Leicester University, University Road, Leicester, LE1 7RH, UK.

Plasma chemistry

22–27 August
11th International Symposium on Plasma Chemistry.
Loughborough, Leicestershire, UK.
ISPC 11, Loughborough University, Loughborough, Leicestershire, LE11 3TU, UK. Tel: +44 (509) 224172. Fax: +44 (509) 222854.

Macromolecule–metal complexes

30 August – 3 September
5th International Symposium on Macromolecule-Metal Complexes.
Bremen, Germany.
Prof. D. Wöhrle, Institute of Organic & Macromolecular Chemistry, University of Bremen, Leobener Str. NW 11, W-2800 Bremen 33, Germany.

Euroanalysis VIII

5–11 September
Euroanalysis VIII — European Conference on Analytical Chemistry.
Edinburgh, UK.
Miss P. E. Hutchinson, Analytical Division, Royal Society of Chemistry, Burlington House, Piccadilly, London W1V OBN, UK. Tel: +44 (71) 437 8656. Fax: +44 (71) 734 1227. Telex: 268001.

Advanced polymer materials

6–10 September
International Conference on Advanced Polymer Materials.
Dresden, Germany.
Technische Universität Dresden, Dezernat 5, Zentrales Tagungsbüro, Mommsenstraße 13, Dresden, O-8027, Germany.

Organometallic chemistry

19–23 September
7th International Symposium on Organometallic Chemistry Directed Toward Organic Synthesis (OMCOS-7).
Kobe, Japan.
Prof. Shun-Ichi Murahashi, Department of Chemistry, Faculty of Engineering Science, Osaka University, Machikaneyama, Toyonaka, Osaka 560, Japan.

1994

Natural products chemistry

16–20 January
19th International Symposium on Natural Products Chemistry.
Karachi, Pakistan.
Prof. Atta-ur-Rahman, Chairman, Organizing Committee, H.E.J. Research Institute of Chemistry, University of Karachi, Karachi-75270, Pakistan. Tel: +92 (21) 470007 or 476131. Fax: +92 (21) 467887 or 466896. Telex: 28095 HEJRI PK. E-Mail: atta%hejfirst@unet.uu.net.

High-temperature materials chemistry

5–8 April
8th High Temperature Materials Conference (HTMC VIII).
Vienna, Austria.
Prof. K. L. Komarek, Institut für Anorganische Chemie der Universität Wien, Währingerstraße 42, A-1090 Wien, Austria.
Tel: +43 (222) 345 424,
Fax: +43 (222) 310 4597.

Pesticide chemistry

4–9 July
8th Interntional Congress of Pesticide Chemistry.
Washington, DC, USA.
Dr J. R. Plimmer, ABC Laboratories, 7200 ABC Lane, PO Box 1097, Columbia, MO 65205, USA.

Macromolecules

11–15 July
35th International Symposium on Macromolecules.
Ohio, USA.
Macroakron'94, Cathy Manus-Gray, Symposium Coordinator, Institute of Polymer Science, The University of Akron, Akron, OH 44325-3909, USA.

Carbohydrates

17–22 July
17th International Carbohydrate Symposium. Ottawa, Canada.
Dr H. Jennings, Institute of Biological Sciences, National Research Council of Canada, 100 Sussex Drive, Ottawa, Ontario, Canada, K1A OR6.

Coordination chemistry

24–29 July
30th International Conference on Coordination Chemistry.
Kyoto, Japan.
Prof. H. Ohtaki, Laboratories of Coordination Chemistry, Institute for Molecular Science, Myodaiji-cho, Okazaki 444, Japan.

Physical organic chemistry

September
12th International Conference on Physical Organic Chemistry.
Padova, Italy.
Prof. G. Scorrano, Dipartimento di Chimica Organica, Università degli Studi di Padova, Via Marzolo 1, 35100 Padova, Italy.
Fax: +39 (49) 831222.

Liquid crystal polymers

6–9 September 1994. International Conference on Liquid Crystal Polymers. Beijing, China.
Prof. Xibai Qiu, Chinese Chemical Society, PO Box 2709, Beijing 100080, China.

Organic synthesis

December
10th International Conference on Organic Synthesis.
Bangalore, India.
Prof. G. S. R. Subba Rao, Department of Organic Chemistry, Indian Institute of Science, Bangalore 560 012, India.

How to apply for IUPAC sponsorship

To apply for IUPAC sponsorship, conference organizers should write to the IUPAC Secretariat (see inside back cover for address) requesting an Advanced Information Questionnaire (AIQ). Completed AIQs should be returned to the Secretariat preferably 2 YEARS and at least 12 months before the conference. Late applications will not be considered. Further information on granting of IUPAC sponsorship was published in *Chem. Intl.* **6, 203 (1992).**

International Union of Pure and Applied Chemistry (IUPAC)

IUPAC

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The International Union of Pure and Applied Chemistry (IUPAC), formed in 1919, is a voluntary non-governmental, non-profit association of organizations, each of which represents the chemists of a member country.

Its objectives are:

- to promote continuing co-operation among the chemists of the member countries;
- to study topics of international importance to pure and applied chemistry which need regulation, standardization, or codification;
- to co-operate with other international organizations which deal with topics of a chemical nature;
- to contribute to the advancement of pure and applied chemistry in all its aspects.

The membership of IUPAC presently comprises 45 countries, each represented by a national organization, such as an academy of science or research council.

National Adhering Organizations

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Front cover: Members of the IUPAC Task Force on Scientific Aspects of the Destruction of Chemical Warfare Agents visit the CBDE destruction facility for old chemical weapons at Porton Down, near Salisbury, UK. (*Photo courtesy CBDE*).

Destruction of chemical warfare agents

The IUPAC Task Force on Scientific Aspects of the Destruction of Chemical Warfare Agents held its first meeting in February 1993 – just a few weeks after the signing of the Chemical Weapons Convention in Paris.

Introduction

The Chemical Weapons Convention, which was signed in Paris on 13–15 January 1993 by 130 nations, bans the development, production, acquisition, stockpiling and use of chemical weapons and is the first multilateral arms control treaty with verification to ban an entire class of weapons.

It was particularly appropriate, therefore, that the IUPAC Task Force on Scientific Aspects of the Destruction of Chemical Warfare Agents should hold its first meeting soon afterwards. The meeting, which was hosted by the Chemical and Biological Defence Establishment (CBDE), Porton Down, near Salisbury, UK, took place on 22–24 February. Experts from France, Germany, Italy, Poland, Russia, UK and USA attended. The meeting was co-chaired by Joseph Bunnett (University of California, USA) and Ron G. Manley (CBDE).

On the opening day, Task Force members were welcomed by Graham Pearson, Director General CBDE. In his opening address, Dr Pearson noted that the United Kingdom abandoned offensive chemical and biological weapons in the late 1950s and since then has been wholly concerned with the provision of effective protective measures against the potential threat from these weapons.

The agenda included a tour of the CBDE destruction facility for old chemical weapons and chemical agent detection and analytical laboratory. A full report on the meeting will appear in a forthcoming issue of *Chemistry International*. During the meeting, the Task Force released the following Information Statement.

First meeting of the Task Force.

INFORMATION STATEMENT

The IUPAC Task Force on Scientific Aspects of the Destruction of Chemical Warfare Agents is officially a subcommittee of the IUPAC Division of Organic Chemistry. Its chairman is Joseph Bunnett of the University of California, Santa Cruz, USA, and its vice-chairman Irina Beletskaya of Lomonosov Moscow State University. Other members are distinguished chemists from Australia, France, Germany, Italy, Japan, Poland, UK and USA.

CBDE Director General Graham Pearson (left) and Joseph Bunnett.

OBJECTIVES

The Task Force seeks (i) to identify scientific questions related to the destruction of chemical warfare agents ('poison gases') that need further investigation by research; and (ii) to obtain and disseminate information about potential destruction processes. It wishes to be helpful to authorities faced with chemical munitions destruction problems.

THE PROBLEM

Several powers possess vast stocks of poison gases, some even left over from World War I. In some nations, the quantity on hand exceeds 40 000 tons, and there are reports that more than 100 000 tons of German chemical munitions were dumped into the Baltic Sea at the end of World War II.

The principal poison gases of concern are 'mustard' (actually a heavy oil), 'nerve gases' (liquids of considerable volatility) and arsenical agents. In part, these noxious materials were packed years ago into shells or rockets, some of which have begun to leak. Public opinion, international agreements and national authorities in several nations require destruction of these weapons. Expenditure of billions of dollars may be required.

WORK OF THE TASK FORCE

The initial phase is learning, by reading, discussion and site visits, the current status of knowledge of the chemistry of 'mustard' and nerve gases, and of technologies for their destruction. This phase is to occur in three stages:

1 Reading about the topic (now happening).
2 Sponsoring a 'workshop' meeting of scientists and technologists who have done relevant work. This would not be a conventional scientific meeting of formal lectures, but rather one that would hear short informational talks on specific matters, and would discuss those matters rigorously.
3 Site visits by the Task Force or subcommittees thereof. These would be to mustard and nerve gas 'warehouses', to existing installations for their destruction, and to pilot plants of similar purpose.

Task Force members visit the CBDE destruction facility for old chemical weapons.

After learning activities of such character, the Task Force will reassemble, assess the current state of knowledge of nerve gas chemistry and destruction technology, and define what further research needs yet to be done towards ensuring safety and achieving economies in the actual destruction work. Its main report to the world will be published, after review, in the IUPAC journal, *Pure and Applied Chemistry*. Any further publications would be derivative from that report, or parallel to it.

Beyond that, whether or how to continue work of the Task Force will be decided by IUPAC officials with attention to the status of the problem at that time.

WHAT THE TASK FORCE DOES NOT INTEND TO DO

The Task Force as such will not undertake laboratory or field research, although members of it as individual scientists may do so.

The Task Force will not seek to learn 'classified' (militarily secret) information. It will consider itself free to divulge publicly any information it obtains or conclusions it reaches, subject to the obligation of scientists to study a matter thoroughly before speaking out about it.

Use of chemical warfare agents is regarded by many as immoral, and is sometimes strongly protested on moral grounds. There are cogent political questions as to whether, how, and where the agents should be destroyed. Without denying the legitimacy of moral concerns, or the importance of the political questions, the Task Force intends not to become involved in either moralistic or political movements. Its attention will be given to scientific questions.

The Task Force will have no administrative authority over persons in charge of existing stocks of chemical warfare agents. It will not pretend to have such authority, and will not exert pressure for adoption of any particular technology. It aims to make its judgements and recommendations publicly available, believing that national authorities will find them useful.

CONDITIONS FOR SUCCESSFUL WORK

If the proposed Task Force is to be successful, these conditions must be fulfilled:

1 Adequate financial support for its activities must be available.

2 The spirit of T. C. Chamberlin[1] must prevail. Briefly, he held that for scientists to make optimum progress in solving problems, they must avoid becoming deeply committed to single working hypotheses. In the present context, that means that a participant must not approach the work with determination to advance and support one particular technology that he or she initially favours, but must keep a truly open mind.

Preliminary conversations with authorities in Russia and in the USA indicate considerable interest in the work of the Task Force, and willingness to cooperate. Mutual cooperation with authorities will be very important to the work of the Task Force.

CONCEIVABLE SEQUELS

If the Task Force recommends further studies of certain aspects of 'mustard' or nerve gas destruction problems, either through fundamental research or pilot plant work, those studies should be separately funded. They should be conducted under the leadership of designated Principal Investigators, who would have normal rights for publication of their work, but would have a special obligation to keep the Task Force informed of progress by means of interim reports. The Task Force would be obliged not release to the public information disclosed in the interim reports without permission of the Principal Investigator.

Reference

1 T. C. Chamberlin, 'The method of multiple working hypotheses', *Science* [old series] **15**, 92 (1890); **148**, 754 (1965)

(*Photos courtesy CBDE*)

Ron Manley (right) with Task Force members in the chemical agent detection and analytical laboratory at Porton Down.

Pesticides in surface water

A Workshop on Pesticides in Surface Waters: Mechanism of Transport and Control was held at the University of Hamburg, Germany, on 13–14 August 1991. The workshop was organized by the IUPAC Commission on Water Chemistry and sponsored by the International Council of Scientific Unions (ICSU). The proceedings have now been published. Five papers deal with technical issues and seven with pesticide regulations relating to water in different countries. The following is Tony Dobbs introduction to the workshop and the proceedings.

Background

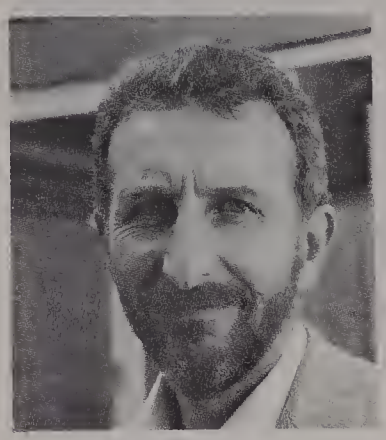
The control of pesticide residues in fresh waters is a current concern in most countries. This workshop is an attempt by IUPAC with assistance from ICSU to bring together the best current practical technical and scientific guidance to assist those concerned with regulation, control and monitoring of pesticide residues in water with their tasks. The emphasis of the workshop will be on agricultural pesticide usage and on surface waters but much of the material is relevant to non-agricultural pesticide use and to groundwater – which is often anyway difficult to distinguish from surface water. It will not deal with the issue of assessment of the environmental impact of pesticide residues in water.

The main elements of the problem are described in general terms in Table 1. The combination of the relatively large number of active ingredients that can be used together with the sampling and analytical difficulties make a standard chemical monitoring approach to the entire problem too expensive to contemplate and a combined approach of monitoring usage, predictive modelling and focused chemical monitoring seems to be the only practicable solution at this time. The papers in this workshop present some of the technical issues involved and this introduction indicates the way in which different components can be combined to provide a predictive model to guide chemical or other water monitoring programmes.

Table 1. Elements of the problem of prediction of pesticide residues in waters.

1. Large numbers of different active ingredients used
2. Changing patterns of usage and formulations (ai's)
3. Influence of application time, weather catchment details and water movement
4. Behaviour in soil, substrata and water bodies
5. Low concentrations of concern – legislation and biological effect
6. Monitoring difficulties – sampling and analysis

The problem can be illustrated by reference to the UK situation as summarised in the recent report by the Chief Inspector, Drinking Water Inspectorate (HMSO 1991). This indicates that there are approximately 450 individual substances used as pesticides and of these water companies have monitored for 130 of them in roughly half a million samples taken over roughly two years. Some pesticides have been found in drinking water supplies at levels above



Tony Dobbs (WRc plc, Medmenham, Marlow, UK) is Chairman of the Commission on Water Chemistry.

those set by the Drinking Water Regulations and specifically 43 individual pesticides were detected at levels greater than the standard of 0.1 μg/l. Atrazine, simazine, isoproturon, chlortoluron and mecoprop were most frequently detected which illustrates that the sources are not limited to agricultural use alone. Atrazine is used most commonly in the UK on roadsides and railways and about 30% of the use of simazine arises from non-agricultural sources.

Factors affecting the occurrence of pesticides in water

The factors influencing environmental pesticide concentrations are listed in Table 2. Many of these factors are interdependent so the precise link between pesticide usage and residue occurrence in water is very complex and by no means fully understood. At present the relationships can only be expressed in general nevertheless very useful terms.

Table 2. Factors influencing pesticide residues in surface waters

Inputs	• diffuse atmospheric inputs • pesticide use, active ingredients amount, time and mode of application location
Location	• catchment hydrology • meteorological conditions • other sources • catchment characteristics, e.g. soil depth and type
Pesticide properties	• formulation • persistence • mobility

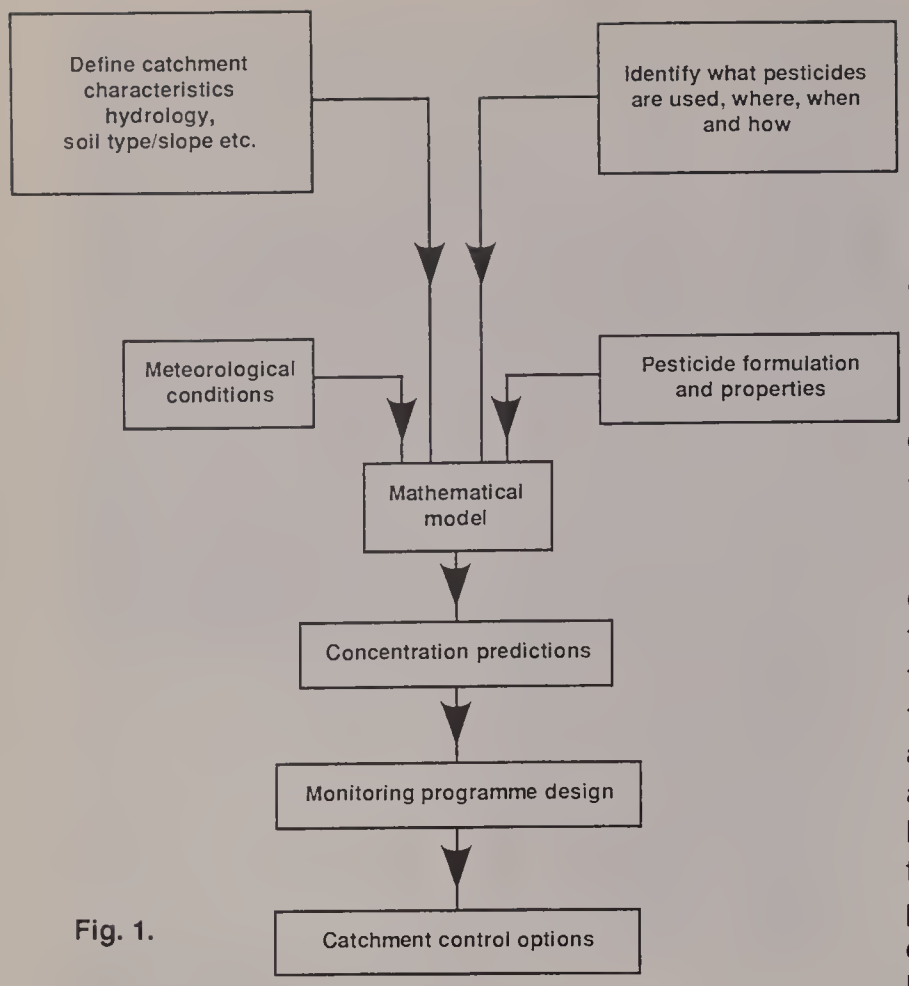

Define catchment characteristics hydrology, soil type/slope etc.
Identify what pesticides are used, where, when and how
Meteorological conditions
Pesticide formulation and properties
Mathematical model
Concentration predictions
Monitoring programme design
Catchment control options

Fig. 1.

An approach to predicting the presence and magnitude of pesticides residues in water

Although much is yet to be understood about the processes and mechanisms by which pesticides occur in water courses it is possible now to assemble sufficient information to enable reasonably reliable estimates of occurrence and concentration to be made.

The key stages of an approach we are involved in at WRc is shown in Fig. 1 which I hope will be of use as a framework for the other presentations you will hear in this workshop. For the purposes of this discussion the contribution from diffuse sources arising from rainfall are not considered further. In this case usage is the major input and accurate information on usage is the most important first stage in addressing the overall problem.

Market survey approaches are probably the most accurate way of collecting such information and are much more relevant than simple gross statistics such as annual production, sales or import of active ingredient. An example of such a scheme is that recently offered in the United Kingdom by WRc and 'Farmstat'. Using continuous surveys of farming practice and arable crop pesticide usage the scheme provides accurate estimates of change in crops grown, changes in farming practice and changes in pesticide (and fertiliser) use. Over 11 years of data are available and the information is continually updated four times a year from over 2000 participating farmers and the monitoring of over 45000 separate fields. Detailed information is collected on all main arable crops including the pesticide brand name, the application date and rate, crop type and farm location. The information is then statistically weighted to be representative of farming behaviour and therefore the pesticide loading within a specific winter catchment, by ingredient on a month-by-month basis for each of the crop areas and aggregated to provide detailed pesticide usage on a catchment basis.

This scheme is currently being expanded to address the non-arable use of pesticides and pesticide breakdown products as part of the development of a modelling procedure which will predict the concentration of pesticides in groundwater and surface water.

Information on usage can then be linked as in Fig. 1 to a mathematical model. The development of this model relies crucially on the mechanisms of surface run off, soil infiltration, aquifer recharge and meteorological conditions, particularly the incidence and amount of rainfall following pesticide application which is of great importance. The approach we are adopting at WRc for the groundwater situation is based on the nitrate modelling studies undertaken by over many years. This model includes the ability to take fissure flow into account which has been shown to be important for simulating isoprotron leaching and is not included in soil models such as the Pesticide Root Zone Model (PRZM).

In the longer term we believe all these components will be brought together in Geographic Information Systems (GIS) for water supply catchments which will have embedded information on hydrology, soil type etc. and will be fed data on agricultural practices including pesticide use, and meteorology giving an output of the risk of pesticide occurrence at different locations and times in the waters of concern.

Pesticides in Surface Waters: Mechanisms of Transport and Control *edited by A. J. Dobbs, W. J. G. M. Peijnenburg, T. R. Roberts and M. Waldman is published on behalf of IUPAC by WRC. Price GBP 25.00. It can be purchased from WRc plc, Henley Road, Medmenham, Marlow, Buckinghamshire SL7 2HD, UK.*

Mode of application is one of the factors influencing pesticide residues in surface waters.

PAC review

Pure and Applied Chemistry (*PAC*) is IUPAC's official journal. It publishes the main invited lectures of symposia sponsored by the Union; the recommendations of its Commissions on nomenclature, symbols and units, and technical reports on standardization, recommended procedures, collaborative studies and dara compilations. Summaries of the most recent IUPAC recommendations on nomenclature and symbols, and technical reports appearing in *PAC* are published in *Chem. Intl.* in the section Recent Reports. In this section we take a brief look at the symposia and lectures published in recent issues of *PAC*.

Four papers from the Jerusalem Conference on Computers in Chemical Research and Education were published in the February 1993 issue of *Pure Appl. Chem.*

Three conferences

The February issue of *Pure. Appl. Chem.* contains papers from three IUPAC-sponsored conferences:

- 5th Solubility Phenomena, Moscow, Russia, July 1992
- 10th Computers in Chemical Research & Education, Jerusalem, Israel, July 1992
- 4th Flame Structure, Novosibirsk, Russia, August 1992.

Papers published from the first of these, the 5th International Symposium on Solubility Phenomena held in Moscow, on 8–10 July, include: 'Phase equilibrium investigations of fluid systems at high pressures' by Gerhard Schneider (Ruhr-Universität Bochum, Germany) who is a member of the Physical Chemistry Division Committee; 'Thermodynamics of solubility in mixed solvent systems' by Jack Lorimer (University of Western Ontario, Canada) who was Chairman of the Commission on Solubility Data (V.8) and 'Thermodynamics of solubility in mixed solvent systems' by Angela Danil de Namor who is an Associate Member of Commission V.8.

IUPAC affiliate Hitoshi Ohtaki (Institute for Molecular Science, Okazaki, Japan) presented a paper on 'Dissolution and nucleation phenomena of salts in water. Molecular dynamic approaches and supporting solution X-ray diffraction measurements'. He pointed out that recently developed molecular dynamics (MD) simulations can provide dynamic and structural information concerning dissolution and nucleation of crystals in water. In his paper, published in the February issue of the journal, he summarizes recent studies on dissolution and nucleation processes of alkali halide studies by MD. In order to have some experimental support for the simulation studies, his team has carried out solution X-ray diffraction measurements for saturated and supersaturated solutions of some alkali halides and compared the X-ray diffraction data with those of the MD simulations.

Four papers from the 10th International Conference on Computers in Chemical Research and Education held in Jerusalem, on 12–17 July 1992, were published in the February issue: 'Computers in drug design' by W. Graham Richards (Oxford, UK; 'Chirbase: A molecular database for storage and retrieval of chromatographic chiral separations' by Christian Roussel and Patrick Piras (University Aix-Marseille, France); 'Multimedia technology: A catalyst for change in chemical education' by Loretta L. Jones (University of Northern Colorado, USA) and Stanley G. Smith (University of Illinois at Urbana-Champaign, USA); and 'Chemical information in the 21st Century' by Stephen Heller (Beltsville, USA) who is Chairman of the Committee on Chemical Databases.

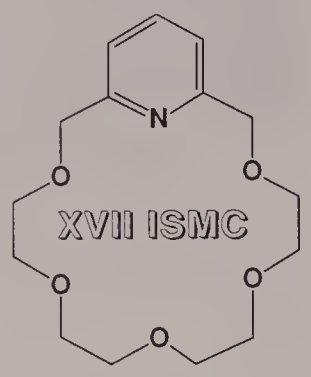
Loretta Jones is an IUPAC affiliate. In the abstract to her paper co-authored with Stanley Smith, she states that multimedia chemistry lessons using video images stored on either videodiscs or CD-ROM allow students to safely investigate a wide variety of chemical systems. The technology also allows students to perform more experiments than possible in a laboratory setting alone and to interact with course content while conducting experiments. According to Jones and Smith these capabilities challenge our beliefs about what kinds of activities are possible for introductory chemistry students.

The final section of the February issue of *Pure Appl. Chem.* is devoted to ten plenary and invited lectures presented at the 4th International Seminar on Flame Structure held in Novosibirsk, on 18–22 August 1992. Included is a paper on 'Modelling of combustion and NO_x emissions in industrial equipment' by J. L. T. Azevedo and four co-workers from the Instituto Superior Técnico (IST), Technical University of Lisbon, Portugal.

In the abstract to the paper, the authors state that the development of industrial boilers and furnaces with higher efficiencies and lower environmental impact, together with the advances in computer power, has promoted the development of comprehensive models that simulate fluid flow, heat transfer, combustion and pollutant formation. The paper reviews modelling work performed at IST concerning the prediction of industrial combustion equipment behaviour and NO emissions.

The model is based on the solution of transport equations for momentum, enthalpy, chemical species concentration and turbulent quantities. In the case of coal combustion a Lagrangian description of the particles is considered using a two-way coupling between the particle phase and continuum gas phase. The NO_x formation is considered in a post-processor routine. The models are applied to gas and oil-fired glass melting furnaces and utility boilers where NO emissions are estimated using the Zeldovich mechanism for thermal-NO. For pulverised coal combustion applications to a single burner furnace and to a multi-burner boiler are described and NO emissions are estimated using the De'Soete reaction mechanism for fuel-NO.

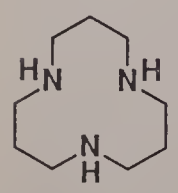
Macrocyclic chemistry



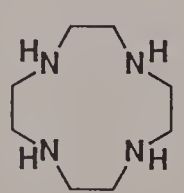
The March 1993 issue of *Pure Appl. Chem.* is devoted to the 7th International Symposium on Macrocyclic Chemistry held in Provo, Utah, USA, on 9–14 August 1992 (XVII ISMC). The Co-Chairmen of XVII ISMC were IUPAC affiliate Reed M. Izatt and Jerald S. Bradshaw.

Topics presented at the symposium included analytical applications: molecular binding of cations, anions and neutral molecules; synthesis of macrocyclic ligands; biological applications; molecular recognition; structures of free and complexed ligands; and chemical separations. These topics were covered by 8 plenary lectures, 33 invited lectures, 15 short talks and 124 posters. More than 240 participants attended the meeting.

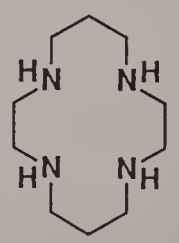
The plenary lectures included the 1992 Izatt-Christensen Award address by Eiichi Kimura of Hirsohima University, Japan. The title of his lecture was 'Roles of zinc(II) ion in zinc enzymes'. He pointed out that zinc(II) complexes of macrocyclic polyamines **1**, **2** and **3** make good models for zinc enzyme (e.g. carbonic anhydrase, alcohol dehydrogenase, phosphatase) active centres. Kimura disclosed intrinsic acid properties of Zn(II) pertinent to biological functions. The zinc(II) ion is not only important kinetically but also plays an indispensable role thermodynamically.



1
[12]aneN$_3$



2
[12]aneN$_4$ (cyclen)



3
[14]aneN$_4$ (cyclam)

IUPAC affiliate contributions

Several IUPAC affiliates contributed papers to XVII ISMC. Affiliate Jonathan L. Sessler (University of Texas at Austin, USA) presented a paper on 'Anion binding: a new direction in porphyrin-related research'. The paper, which was co-authored by Sessler and 7 other scientists at the university's Department of Chemistry and Biochemistry, described a new approach to the chelation of anionic substrates, based on the use of large, pyrrole-containing macrocycles, the so-called 'expanded porphyrins'.

This anion binding, which is without precedent in simpler porphyrin-type systems, is manifest both in the solid state and in solution. In Sessler's paper, it is illustrated in terms of solid state structural results obtained from single-crystal X-ray diffraction structural analyses of various anion complexes of three prototypic systems, namely the sapphyrins, anthraphyrins, and rubyrins.

IUPAC affiliates also either presented or contributed to the following XVII ISMC papers published in the March issue of *Pure Appl. Chem.*: 'Ionic recognition by proton-ionizable lariat ethers and their polymers' (Richard A. Bartsch, USA); 'From molecules to electrolytes. Electrochemical and thermodynamic aspects of the interaction of phenol and resorcinol based calixarenes with amines' (David A. Pacheco Tanaka and Felix J. Sueros Velarde, University of Surrey, UK); 'Synthesis and characterization of coumarin-crown ethers', Çakil Erk (Technical University of Istanbul, Turkey); 'Complexation of Zn(II) ion with macrocyclic ligands containing nitrogen-oxygen donors (Si-Joong Kim, Korea University, Seoul); 'Simple methods for the preparation of cryptands' (Reed M. Izatt, Brigham Young University, USA).

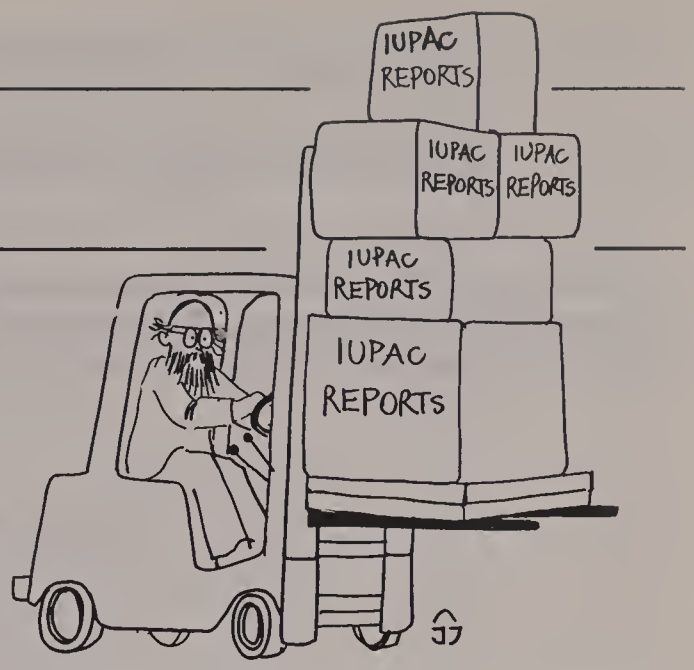
Heteroatom chemistry and carbohydrates

A total of 19 plenary and invited lectures presented at the 3rd International Conference on Heteroatom Chemistry held in Riccione, Italy, on 7–12 June 1992 were published in the April 1993 issue of *Pure Appl. Chem.* Topics covered included asymmetric synthesis, self-assembly and the chemistry of various heteroatomic compounds, for example, compounds containing boron, phosphorus, selenium and sulphur. The introduction of a paper entitled 'Organosulfur chemistry of garlic and onion: Recent results' by Block *et al.* will be published in the next issue of *Chem. Intl.*

Nine plenary lectures from the 16th International Carbohydrate Symposium which took place in Paris, France, on 5–10 July 1992, were also published in the April issue of *Pure Appl. Chem.* Topics included the syntheses of glycosides and sialosides, dissection of heparin, and the structures of oligosaccharides.

Recent Reports

In this section we publish summaries of the most recent IUPAC recommendations on nomenclature and symbols and technical reports. The full texts of these recommendations and reports are published in *PAC*.



Nomenclature for chromatography

This report presents definitions of terms and symbols used in all chromatographic separations. The reports covers gas, liquid, size-exclusion, ion-exchange and supercritical-fluid chromatography and both column and planar modes of separation. Definitions are included for the description of the separation process, the chromatographic system and equipment and the properties of detectors.

This report was prepared for publication by L. S. Ettre, Commission on Chromatography and Other Analytical Separations/Commission on Analytical Nomenclature, Analytical Chemistry Division, and published in Pure Appl. Chem, ***65****, 819-872 (1993).*

Letter to the Editor

Molar amount or chemical amount?

Sir,

Rigg[1] has drawn attention to the unfortunate decisions that were made in 1969 over the naming of the quantities that had previously been called **number of moles** (*n* in mol), **mole fraction** (*x*), **molar concentration** or **molarity** (*c*), **molality** (*m*), and **molar** quantities (*X*/*n* or *X*/*c*). Some renaming was necessary to make the nomenclature conform to quantity calculus ('number moles' does not do this).[2] However, a further principle was also applied: that the name for a physical quantity should not imply a particular choice of unit (as, e.g., 'mileage' does).[3] This led to *n* being called **amount of substance** and *c* **amount concentration**, although **mole fraction**, **molality** and **molar** were retained for *x*, *m*, and *X*/*n* or *X*/*c*.[2] The result is doubly unsatisfactory in that the names for *n* and *c* are awkward and unclear,[4] and the terminology is inconsistent.

One solution to this problem is not to apply McGlashan's principle at all. This can be defended on the grounds that it has not been applied in the naming of *x*, *m*, *X*/*n*, and *X*/*c*, and that, as there has only ever been one unit for *n*, there is no risk of producing absurdities of the kind 'mileage = 20 km'. On this basis, *n* could be called **molar amount** and *c* **molar concentration** or **molarity** as suggested by Kohman[5] and supported by Rigg.[1] Rigg has further suggested that, if a more distinct name is desired for quantities of the kind *X*/*n*, this could be **molic**.

The alternative is to find a better name for *n* and to apply McGlashan's principle fully. A good name for *n* would be **chemometric amount**, but Gorin's **chemical amount** is less cumbersome, and has growing support.[6] The corresponding names for the other quantities are: *x*, **chemical fraction**; *c*, **chemical concentration**; *m*, **chemical mass concentration**; *X*/*n*, **per-chemical-amount quantity**, and *X*/*c*, **per-chemical-concentration quantity**. In these 'chemical' can be shortened to 'chem', 'per-chemical-amount' to 'perchem', and 'per-chemical-concentration' to 'perconc'.

Of these solutions, the second is better in that it conforms to McGlashan's principle, but the first involves less change, and may be more acceptable to the chemical community. It would be interesting to know which readers prefer.

P. G. Nelson
School of Chemistry
University of Hull
UK

References

1 J. C. Rigg, *Chem. Intl.* **15**, 64 (1993)
2 Green Book [M. L. McGlashan, *Manual of Symbols and Terminology for Physicochemical Quantities and Units.* Butterworths, London (1969) and I. Mills, T. Cvitaš, K. Homann, N. Kallay, K. Kuchitsu, *Quantities, Units and Symbols in Physical Chemistry*, Blackwell Scientific Publications, Oxford (1988)]
3 M. L. McGlashan, *Physico-chemical Quantities and Units.* Royal Institute of Chemistry, London (1968, 1971).
4 See, for example, P. G. Nelson, *Chem. Intl.* **11**, 8, 87 (1989).
5 T. P. Kohman, *Chem. Intl.* **14**, 207 (1992).
6 T. Cvitaš, *Chem. Intl.* **14**, 100 (1992).

Table of atomic weights to five significant figures

The following 1991 Table of Standard Atomic Weights Abridged to Five Significant Figures was prepared for publication by J. Cesario, N. N. Greenwood and H. S. Peiser (Commission on Atomic Weights and Isotopic Abundances, Inorganic Chemistry Division).

Introduction

The detail and the number of significant figures in the IUPAC Table of Standard Atomic Weights exceed the needs and interests of most users, who are more concerned with the length of time during which a given table has validity to the precision limit of their interests. The Commission on Atomic Weights and Isotopic Abundances in 1987 therefore decided to prepare for publication a revised and updated version of the 1981 Table of Atomic Weights abridged to Five Significant Figures, or fewer where uncertainties do not warrant even five-figure accuracy (this currently applied to 9 elements). When an atomic weight is known to more than five significant figures, it is abridged in this Table to the five-figure value closest to the unabridged best value. When the sixth digit of the unabridged value is five exactly, it is rounded up or down to make the fifth digit in this abridged Table even. The single-digit uncertainty in the tabulated atomic weight is held to be symmetric, that is, it is applicable with either a positive or a negative sign.

The abridged table is given here with the reasonable expectation that the quoted values for most elements will never need to be changed – a desirable attribute for textbooks and numerical tables derived from atomic-weight data. However, it should be understood that the atomic-weight values for 29 elements are still uncertain by more than one unit in the fifth significant figure. Moreover, for 21 additional elements the indicated uncertainty range in the unabridged table includes values which when rounded to five significant figures would show a change in the fifth figure. For some of these elements minor changes in their best standard atomic weight to five significant figures could occasionally be required as more accurate values become available as a result of the biennial revision of the unabridged table. Most annotated warnings of anomalous geological occurrences, isotopically altered materials, and variability of radioactive elements are relevant even in the abridged table.

This Table may be freely reprinted provided it includes the annotations and the rubric at the head of the Table, and provided the IUPAC source is acknowledged.

Atomic weights are here quoted to five significant figures unless the dependable accuracy is more limited by either the combined uncertainties of the best published atomic-weight determinations, or by the variability of isotopic composition in normal terrestrial occurrences (the latter applied to elements **annotated r**). The last significant figure of each tabulated value is considered reliable to ± 1 except when a larger single-digit uncertainty is inserted in parentheses following the atomic weight. Neither the highest nor the lowest actual atomic weight of any normal sample is thought likely to differ from the tabulated value by more than the assigned uncertainty. However, the tabulated values do not apply either to samples of highly exceptional isotopic composition arising from most unusual geological occurrences (for elements **annotated g**) or to those who isotopic composition has been artificially altered. Such might even be found in commerce without disclosure of that modification (for elements **annotated m**). Elements annotated by an asterisk (*) have no stable isotope and are generally represented in this Table by just one of the element's commonly known radioisotopes, with a corresponding relative atomic mass in the atomic-weight column. However, three such elements (Th, Pa and U) do have a characteristic terrestrial isotopic composition, and for these an atomic weight is tabulated. For more detailed information users should refer to the full IUPAC Table of Standard Atomic Weights, as is found in the biennial reports of the Commission on Atomic Weights and Isotopic Abundances. The most recent table was published in *Pure Appl. Chem.*, **64**, 1519–1534, (1992).

1991 Table of standard atomic weights abridged to five significant figures. Scaled to the relative atomic mass, $A_r(^{12}C) = 12$.

	Name	Symbol	Atomic weight	Annotations
1	Hydrogen	H	1.0079	g m
2	Helium	He	4.0026	
3	Lithium	Li	6.941(2)	g m r
4	Beryllium	Be	9.0122	
5	Boron	B	10.811(5)	g m r
6	Carbon	C	12.011	g r
7	Nitrogen	N	14.007	
8	Oxygen	O	15.999	
9	Fluorine	F	18.998	
10	Neon	Ne	20.180	m
11	Sodium (Natrium)	Na	22.990	
12	Magnesium	Mg	24.305	
13	Aluminium	Al	26.982	
14	Silicon	Si	28.086	
15	Phosphorus	P	30.974	
16	Sulfur	S	32.066(6)	g r
17	Chlorine	Cl	35.453	m
18	Argon	Ar	39.948	g r
19	Potassium (Kalium)	K	39.098	g
20	Calcium	Ca	40.078(4)	g
21	Scandium	Sc	44.956	
22	Titanium	Ti	47.88(3)	
23	Vanadium	V	50.942	
24	Chromium	Cr	51.996	
25	Manganese	Mn	54.938	
26	Iron	Fe	55.847(3)	
27	Cobalt	Co	58.933	
28	Nickel	Ni	58.693	
29	Copper	Cu	63.546(3)	r
30	Zinc	Zn	65.39(2)	
31	Gallium	Ga	69.723	
32	Germanium	Ge	72.61(2)	
33	Arsenic	As	74.922	
34	Selenium	Se	78.96(3)	
35	Bromine	Br	79.904	
36	Krypton	Kr	83.80	g m
37	Rubidium	Rb	85.468	
38	Strontium	Sr	87.62	g r
39	Yttrium	Y	88.906	
40	Zirconium	Zr	91.224(2)	g
41	Niobium	Nb	92.906	
42	Molybdenum	Mo	95.94	g
43	Technetium *	^{99}Tc	98.906	
44	Ruthenium	Ru	101.07(2)	g
45	Rhodium	Rh	102.91	
46	Palladium	Pd	106.42	g
47	Silver	Ag	107.87	
48	Cadmium	Cd	112.41	
49	Indium	In	114.82	
50	Tin	Sn	118.71	
51	Antimony (Stibium)	Sb	121.76(3)	g
52	Tellurium	Te	127.60	g
53	Iodine	I	126.90	
54	Xenon	Xe	131.29(2)	g m
55	Caesium	Cs	132.91	
56	Barium	Ba	137.33	
57	Lanthanum	La	138.91	
58	Cerium	Ce	140.12	g
59	Praseodymium	Pr	140.91	
60	Neodymium	Nd	144.24(3)	g
61	Promethium *	^{147}Pm	146.92	
62	Samarium	Sm	150.36(3)	g
63	Europium	Eu	151.96	g
64	Gadolinium	Gd	157.25(3)	g
65	Terbium	Tb	158.93	
66	Dysprosium	Dy	162.50(3)	g
67	Holmium	Ho	164.93	
68	Erbium	Er	167.26(3)	g
69	Thulium	Tm	168.93	
70	Ytterbium	Yb	173.04(3)	g
71	Lutetium	Lu	174.97	g
72	Hafnium	Hf	178.49(2)	
73	Tantalum	Ta	180.95	
74	Tungsten (Wolfram)	W	183.84	
75	Rhenium	Re	186.21	
76	Osmium	Os	190.23(3)	g
77	Iridium	Ir	192.22(3)	
78	Platinum	Pt	195.08(3)	
79	Gold	Au	196.97	
80	Mercury	Hg	200.59(2)	
81	Thallium	Tl	204.38	
82	Lead	Pb	207.2	g r
83	Bismuth	Bi	208.98	
84	Polonium *	^{210}Po	209.98	
85	Astatine *	^{210}At	209.99	
86	Radon *	^{222}Rn	222.02	
87	Francium *	^{223}Fr	223.02	
88	Radium *	^{226}Ra	226.03	
89	Actinium *	^{227}Ac	227.03	
90	Thorium *	Th	232.04	g
91	Protactinium *	Pa	231.04	
92	Uranium *	U	238.03	g m
93	Neptunium *	^{237}Np	237.05	
94	Plutonium *	^{239}Pu	239.05	
95	Americium *	^{241}Am	241.06	
96	Curium *	^{244}Cm	244.06	
97	Berkelium *	^{249}Bk	249.08	
98	Californium *	^{252}Cf	252.08	
99	Einsteinium *	^{252}Es	252.08	
100	Fermium *	^{257}Fm	257.10	
101	Mendelevium *	^{258}Md	258.10	
102	Nobelium *	^{259}No	259.10	
103	Lawrencium *	^{262}Lr	262.11	

Provisional Recommendations

IUPAC seeks your comments

In this section we publish synopses of IUPAC's latest provisional recommendations on nomennclature and symbols. All comments on these recommendations are welcome and will be taken into consideration. The final revised versions are published in *Pure and Applied Chemistry* and synopses of these are published in *Chem. Intl.* as recent reports.

If you would like to comment on the provisional recommendations please write to your nearest national/regional centre requesting a copy of the full report. Copies are not available from the IUPAC Secretariat. The most up-to-date list of the national/regional centres appeared in *Chem. Intl.* **14**, 25 (1992).

Glossary of terms used in physical organic chemistry

The compilation of a *Glossary of Terms Used in Physical Organic Chemistry* was the first goal of the Commission on Physical Organic Chemistry (III.2) when it was constituted in 1976. It was noted that the formulation of novel scientific concepts was often arbitrary and unclear, and that scientific communication between physical organic chemists had been hampered by disagreement on the meaning of important terms. Accordingly, emphasis in the 1983 Glossary was on terms associated with some ambiguity or uncertainty with respect to its meaning.

The 1993 revision was undertaken with the long-term objective of compiling a compendium of organic chemical terminology. The criteria for inclusion of terms were much expanded, but without including trivial terms or terms approved by other IUPAC commissions. The work was coordinated with that of other projects on IUPAC terminology in organic chemistry (Basic terminology of stereochemistry, Class Names of Organic Compounds and Reactive Intermediates Based on Structure), as well as in other areas (Chemical Kinetics, Commission I.4; Photochemistry, Commission III.3), with the objective of achieving consensus on terms of mutual interest and of avoiding overlap as much as possible.

The aim of the Glossary is to provide guidance on physical organic chemical terminology with a view to achieving a far-reaching consensus on the definitions of useful terms and the abandonment of unsatisfactory ones.

Comments on the document are welcome and should be sent by 30 November 1993 to Prof. Paul Müller, Département de Chimie Organique, Université de Genève, 30, Ernest Ansermet, CH-1211 Genève 4, Switzerland.

Instrumentation for the spectral dispersion and isolation of optical radiation (Provisional Recommendations 1992)

This document deals with nomenclature, symbols and their usage in the field of instrumentation for the dispersion and isolation of optical spectra in the wavelength region from 50 nm to 1 mm, as applied in analytical atomic and molecular emission, absorption and fluorescence spectroscopy. The whole subject is divided into 11 chapters dealing with various aspects of dispersive and non-dispersive spectral apparatus including spectral filters and interferometers. Definitions are given for spectral instruments with and without detection and measuring facilities. The properties of optical components of dispersive and non-dispersive spectral instruments are defined in detail with emphasis on such fundamental figures of merit as spectral purity, resolution, resolving power, conductance of optical systems, characteristic wavelengths and polarization. Terms closely related to the optimum use of spectral instruments, e.g. optimal slit width and height, theoretical and practical effective spectral linewidth, line to background radiant power ratio are given. Terms for various forms of mountings for spectral apparatus are included in the vocabulary.

Comments on the document are welcome and should be sent by 30 November 1993 to Prof. K. Laqua, Grüner Weg 2, D-4600 Dortmund 30, Germany.

Thin films including layers: terminology in relation to their preparation and characterization

This document deals with the terminology in relation to the preparation and characterization of liquid and solid thin films and layers. It is not comprehensive, in that no consideration is given to certain types of layers such as ferromagnetic, ferroelectric, He or liquid metal films. Topics covered include: general terminology and characterization methods applicable to *both* solid and liquid films; terminology and characterization methods applicable *specifically* to either liquid or solid films, layers and multilayers. Comprehensive indices of terms and methodologies (preparation and characterization) are given.

Comments on the document are welcome and should be sent by 30 November 1993 to Lisbeth Ter-Minassian-Saraga, 50 rue de Francs Bourgeois, F-75003 Paris, France.

Comments invited on biochemical thermodyamics report

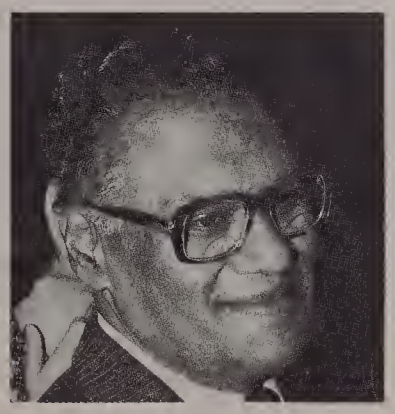
The IUBMB (International Union of Biochemistry and Molecular Biology) – IUPAC Joint Commission on Biochemical Nomenclature, chaired by Prof. J. F. G. Vliegenthart (Utrecht), has appointed a Panel on Biochemical Thermodynamics and asked Prof. Robert A. Alberty, President of the IUPAC Physical Chemistry Division to be the Convener.

This Panel is working on *Recommendations for Nomenclature and Tables in Biochemical Thermodynamics* that will replace *Recommendations for Measurement and Presentation of Biochemical Equilibrium Data* that was published by an Interunion Commission of Biothermodynamics under the Chairmanship of Prof. Wadsö in 1976. This report recommended symbols, units and terminology for biochemical equilibrium data and standard conditions for equilibrium measurements. These recommendations have served biochemistry well, but subsequent developments indicate that new recommendations and an expanded nomenclature are needed. The Panel hopes to complete its recommendation by 1st June 1993.

The Panel will be pleased to receive comments and suggestions on the draft report which can be obtained from: Prof. Robert A. Alberty, Room 6-215, Department of Chemistry, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139, USA. Tel.: +1 (617) 253-2456. Fax: +1 (617) 253-7030. E-mail: alberty@mit.edu.

Chemistry of advanced materials

The recently published *Chemistry of Advanced Materials*, edited by C. N. R. Rao, is one the IUPAC monographs in the 'Chemistry for the 21st Century' series. The following is the 'Introduction' to the book.



Prof. C. N. R. Rao (Solid State & Structural Chemistry Unit, Indian Institute of Science, Bangalore, India) was IUPAC President, 1985–87

Introduction

Chemistry deals with such a wide variety of materials that we can consider it to be an important part of materials science. It is pertinent to recall the traditional interest of chemists in the processing of various metals and in rubber. Chemists made plastics. It is also a matter of pride that some of the great innovators like Michael Faraday were chemists. By virtue of their unique knowledge of synthesis, structure and reactivity, chemists have made monumental contributions to the development of new, advanced materials. Chemists can be really proud of their role in the industrial production of various materials such as polymers, ceramics and catalysts. It is gratifying that a very high percentage of the value of all the goods manufactured in the world involves heterogeneous catalysis and related processes. Plastics and ultra-high-strength composites made of polymeric materials are being continually improved and are finding increasing applications in transport vehicles. By the year 2000, it is likely that plastics will replace half of the steel in various uses. The emerging area of molecular electronics owes much to the development of new types of organic compounds with novel electronic and other properties. Ceramics and metals have been improved through better control of composition and by the use of reinforcing fibres composed of carbon, silicon carbide and such materials. Recent advances in high-temperature superconductors, diamond films and fullerenes may bring about technologies that would play a crucial role in the near future.

In their efforts to improve and characterize materials, chemists have made use of a large variety of physical techniques that yield precise information not only about bulk substances, but also of solid surfaces. Such information, coupled with the use of computer graphics and simulation may lead to new classes of materials, some of which are yet unknown, with novel structure as well as chemical, electrical, magnetic or mechanical properties.

Any effort to provide a complete account of the chemistry of materials would inevitably have to cover the wide gamut of inorganic and organic materials, which may be metallic, polymeric, insulating, superconducting or magnetic. The conventional classification of chemistry as well as of materials fails when we look at the new breed of materials. We have metals and superconductors, which can be organic, or ceramic and polymers, which can be organic or inorganic. Whatever manner one looks at modern materials, one sees the increasing role of chemistry in all aspects of their development. Unfortunately, however, this role has not been fully acknowledged by many scientists and the chemists themselves. In recent years, the area of materials science has become an important discipline by itself and chemists should ensure that their rightful role in the development of materials is duly recognized.

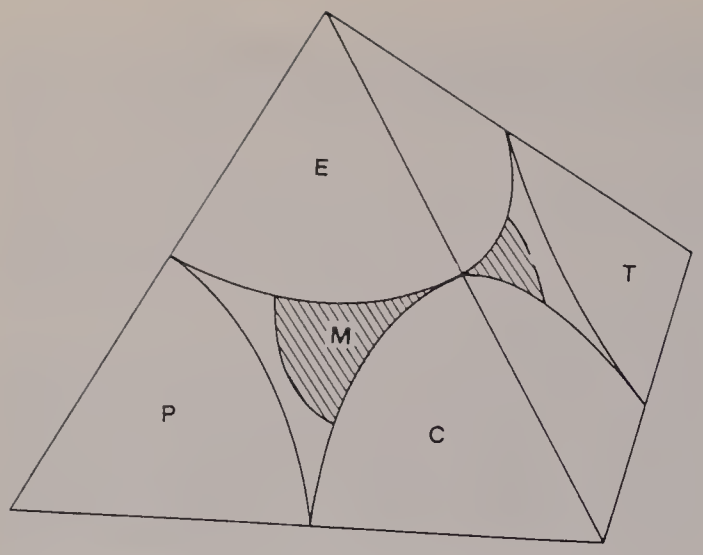


Fig. 1 Materials science (M) at the centre of a tetrahedron: P, physics; C, chemistry; T, theory; E, engineering design.

Materials science

Materials science is distinctly different from the physics and chemistry of materials. Chemistry and physics get transformed into materials science wherever they are motivated by an engineering objective. Materials science can be represented by a tetrahedron (Fig. 1) having as its base, fundamental sciences such as chemistry and physics, embracing both experimental and theoretical aspects. The tetrahedron in Fig. 1 is completed by engineering design associated with a technological target. At the centre, holding the different disciplines, is the interdisciplinary area of materials science. Engineering design requires materials specifications, which are generally formulated in terms of a set of engineering parameters that define functions to be performed. Optimization of engineering parameters requires a theoretical framework to translate from the language of design to the variables or the phenomenological parameters such as shape, size and history. If a material is to be designed to satisfy specific engineering requirements, the theoretical framework should include not only the connections between engineering and the phenomenological parameters, but also a proper understanding of how chemical composition, structure and bonding of the material are related to the particular properties of interest. Without an understanding of these relationships, materials design aimed at performing a new or an improved function would be left to empiricism. Over the last few years, our fundamental understanding of materials has indeed become really advanced and sophisticated owing to cross-disciplinary efforts of which chemistry has been a vital component.

Much of the progress of mankind today is directly or indirectly dependent on advanced technology materials which perform better and with new dimensions. For some time, most of the emphasis was on metallic materials. Today, composites and polymeric materials occupy a prime position as structural materials. Non-metallic materials are gradually replacing metallic ones in various spheres, especially in transport vehicles. Innovations in non-structural materials have been equally stupendous. New types of sensors have been devised for every possible situation. Ceramic materials have become a major component in electronic, electrical, automotive and other industries. Man is excelling himself in making better and faster 'chips'.

The rapid pace with which the materials world has progressed is clearly due to the uncanny knack of materials scientists who do not leave any stone unturned in search of new and better materials. This effort is really mind boggling. The following are some of the factors that have been responsible for the advances made:

- study of known or even common materials (both natural and unnatural);
- serendipity;
- design (tailor-making and engineering of materials);
- creation of demand for new materials.

All these characteristics would be obvious to everyone. I would like to underscore, however, the need to look carefully at common as well as naturally occurring materials. Coral, which occurs in nature, has given new ideas for designing ferroic composites. Something as common as fish scale shows interesting properties. The last factor requiring materials scientists to create a demand (or a market) for their own area is of some significance.

Non-metallic materials are gradually replacing metallic ones, especially in transport vehicles.

Vitreous carbon – a high-performance carbon composite from New Metals & Chemicals Ltd.

The three key sectors where the demand for advanced technology materials is increasing appear to be:

- communications (ferrites, fibres, lasers, non-linear materials),
- energy (new batteries, fuel cells, solar energy beneficiation),
- transportation (composites, superconductors).

In all these sectors, major revolutions may occur in the next few years. For example, amorphous silicon may soon emerge to be efficient for solar photovoltaic applications. High-temperature superconductors may revolutionize surface transportation (e.g. levitating trains). Even in conventional areas, new materials are likely to outstrip the old ones in performance. For example, the new magnet materials (e.g. Nd–Fe–B, nitrided rare earth alloys) are so much better than the old ferrites or metallic magnets. Photonics is slowly replacing electronics in communications and information technology. There has also been progress in biomaterials (for replacements, transplants, etc.) There are always unexpected developments such as cuprate superconductors and buckminsterfullerene, C_{60}.

Chemistry and advanced materials

Some of the important classes of advanced materials that are of great interest to chemists are:

1 Polymeric materials:
  - structural polymers;
  - functional polymers.

2 Ceramic materials:
  - high-temperature materials (e.g. silicon nitrides);
  - electroceramics (various ferroelectric and ferroelastic materials);
  - superconductors (cuprates);
  - glasses, glass ceramics.

3 Magnetic materials:
  - rare-earth cobalt alloys, Met glasses, the Nd–e–B system.

4 Electronic materials:
  - semiconductor materials (II–IV and III–V compounds);
  - superconductors;
  - molecular materials for electronics (organic conductors, organic non-linear materials, liquid crystals).

5 Catalysts and absorbents:
  - controlled-pore inorganic solids such as zeolites.

6 Other novel materials:
  - super-hard materials (diamond and cubic BN);
  - diamond films;
  - sensor materials;
  - new cements.

It is easy to see how in each of these areas, chemists are involved in synthesis, modification, substitution, reactivity and properties of materials. The variety in these materials is truly astounding. Then, not all the materials are crystalline monophasic, single component substances. Some are amorphous and some are in the form of films while some others are complex mixtures of several components and phases.

Many real-life examples can be given in each of the above classes of materials to illustrate how the area develops from strength to strength. Some of the examples would be the following:

- silicon nitrates (SiAlON);
- diamond films;
- zeolites and clays (controlled pore inorganic solids);
- the Lanxide process (new composites);
- new sensors (using oxide and other materials including microbiosensors);
- advanced polymers;
- cuprate superconductors;
- fullerenes.

One cannot but admire the ingenuity of Ken Jack when he decided to replace part of the silicon and nitrogen in silicon nitride (Si–N) by aluminium and oxygen, respectively, to make Si–Al–O–N (Sialon) expecting it to be an improved high temperature ceramic material. One recalls how Deriyagin carried out the first experiments to break hydrocarbons such as ethylene and methane in a reducing atmosphere to deposit carbon in the form of diamond on a metal surface. Diamond films are being investigated in a number of laboratories today and they are likely to find many applications. Zeolites occur in nature, but chemists have synthesized a variety of zeolites which permit shape-selective catalysis by virtue of the specificity of the cage sizes in them. Clays which possess sheet structures can similarly be modified to carry out selective reactions. An unusual example of serendipity and doggedness is provided by the Lanxide process. Newkirk accidentally found sometime

Novel materials include super-hard materials such as cubic BN. These scissors are made from zirconium.

ago that the stuff that collects on the top of molten aluminium is not a useless muck, but an unusual composite containing the metal and aluminium oxide. Processes have since been developed to make this material in large quantities to produce fibres with optimal mechanical properties. Over 200 patents have been filed in the last 3 years. One still does not know what real uses will be found for the unusual composites obtained by the Lanxide process, but a company has been set-up solely based on this innovation.

Sensors clearly provide the finest examples of the versatility and pragmatism of materials chemists. Today, we have sensors for most gases and vapours, for heat and for other forms of radiation. Most sensors use simple materials (e.g. oxides such as ZrO_2, SnO_2 and ZnO) and a device to measure the signal (usually, electrical resistance). The sensor industry is a knowledge-based industry with high returns for a marginal investment. Scientists are working on a variety of biosensors which will make use of specific biological systems (e.g. enzymes) along with appropriate electrodes and measuring devices. For example, a needle-shaped sensor can right-away tell a customer in the supermarket whether the pineapple or melon is ripe or not. One can imagine a new world with people carrying not only the needle-shaped sensors to buy fruits, but a variety of other sensors related to human health (e.g. for diabetes, cholesterol level) and environment.

The various kinds of novel polymers synthesized in recent years are most impressive. Structural polymers, liquid crystalline polymers and the various polymer blends are only a few of the accomplishments. Special mention should be made of Kevlar which is an aramid fibre. Such liquid crystal polymers with high melting points have many applications including making composites. Polymer composites are well-known structural materials; then there are adhesives, adsorbents and membranes made of polymeric materials. The use of polymeric materials in molecular electronics holds such promise.

Great excitement was caused by the discovery of cuprate superconductors, some with transition temperatures well above liquid nitrogen temperature (77 K) during 1986–87. This became possible because of the early work of solid state chemists on layered cuprates of type La_2CuO_4. Chemists have been involved in the design and synthesis of several new cuprate materials (with T_c up to 125 K). Much earlier, chemists had prepared Chevrel phases of the formula A_xMoX_8(A=Cu, La, Ph, etc. X = S or Se) which show ferromagnetism, superconductivity and other interesting properties.

The discovery of C_{60}, C_{70} and other fullerenes and their ready generation in the laboratory promises to usher in a new class of materials. C_{60} could have a role in catalysis. Compounds of C_{60} formed by alkali metals are superconducting. There is a possibility that we can make molecular ferromagnets using C_{60}.

What was enumerated above is at best representative and there are probably better examples one can cite. There is much chemistry behind all such efforts and this is often forgotten. Newer and improved methods of synthesis and characterization are essential aspects of this science. Materials chemists are becoming fearless and are taking on more and more complex materials in all states of aggregation for possible exploitation.

Many examples can be given to illustrate the art and science of materials synthesis. Purification of Si and novel synthesis of III–V and other semiconductors (by organometallic routes, MOCVD) involves much chemistry. Novel less energy-consuming methods of synthesis are being developed all the time. To give an example, the precursor route has eliminated the limitations of the old brute-force methods to yield homogeneous pure substances (e.g. synthesis of Chevrel phases and many complex oxides by the precursor route). Positive and negative pressure effects are attained by appropriate chemical substitution (e.g. partial substitution of V by Ti or Cr in V_2O_3). Similarly, insulators are transformed into metals or superconductors by composition control. The basic tenet is that there must be a way of making any given material in any required shape or form. High-pressure, ultra-high vacuum, very high or low temperatures, plasma, rapid cooling and a variety of other means have been employed to attain the desired conditions for synthesis. A trend worth noting is that many so-called metastable materials are prepared this way for use under ordinary conditions. Metastability is part of the innovation in materials.

Sensors using simple materials are being developed for use in nutrition, human health and the environment.

Techniques for materials characterization have undergone a dramatic change in recent years.

The rate at which man is making use of polymers based on petrochemicals raises the question as to what we will do when most, if not all, of the natural carbon resources such as petroleum are exhausted. This may as well happen sometime in the 21st Century. One may predict that chemists may use inorganic carbon sources (carbonate rocks) to make hydrocarbons.

Techniques of materials characterization have undergone a dramatic change in the last few years. The power of analysis (composition, structure or both) today on the tiniest of samples (a few atoms) is truly remarkable. The present-day electron microscopes have atomic resolution. The power of diffraction has been multiplied with the use of synchrotron X-ray and pulsed neutron sources. Analysis of power diffraction profiles has become an indispensable tool for the determination of the structures of complex materials. The advent of atomic force microscopy and scanning tunnelling microscopy enables the study of materials at atomic level under real conditions (in air, with liquid interface, in vacuum, etc.)

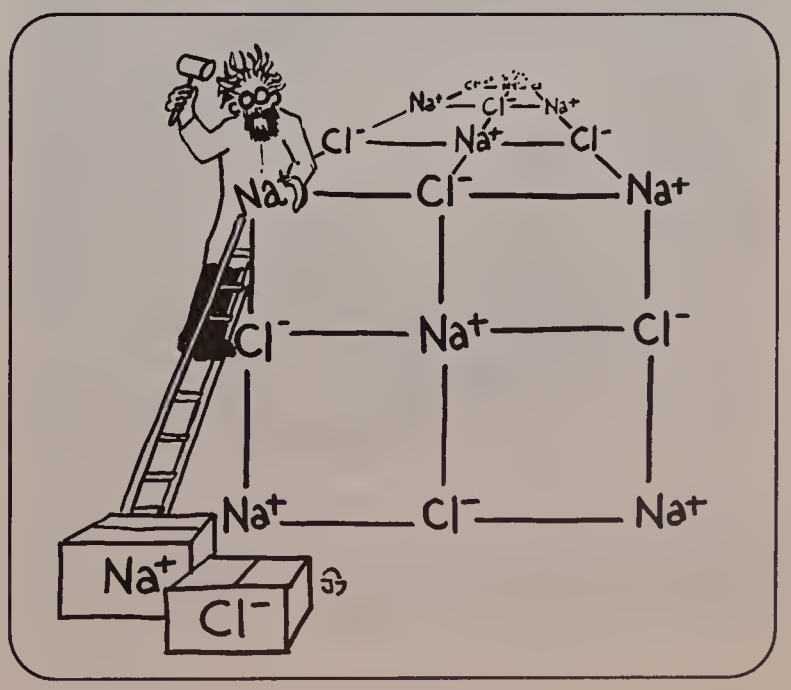
Scope of this monograph

In this monograph, an attempt has been made to describe certain aspects of a few important classes of advanced materials. The attempt is not to be comprehensive or encyclopaedic, but to indicate the nature of recent developments in the chemistry of advanced materials. The following topics have been adequately covered:

- synthetic methods (preparation of oxides and films, novel routes of synthesis);
- ceramics (synthesis, silicon nitrides, nanomaterials);
- magnetic materials;
- molecular electronic materials (typical materials, present status and scope for the future);
- polymeric materials (for optical and electronic applications);
- superconducting materials (materials, synthesis, future scope);
- nanomaterials (scope and importance);
- amorphous materials;
- optoelectronic materials (case study of WO_3);
- diamond films;
- catalysts and adsorbents.

The above list is certainly representative of the different classes of advanced materials listed earlier, although articles on a few others (e.g. cements, liquid crystals, structural polymers) would have probably been desirable. Yet, the present collection should suffice to illustrate the importance of chemistry in the development of advanced materials.

Chemistry of Advanced Materials *is edited by C. N. R. Rao and published by Blackwell Scientific Publications, Oxford, UK, 1993. xvi + 388 pp. ISBN 0-632-03385-1. Price: GBP 69.50/USD 110.00. Affiliate Members discount price GBP 41.70/USD 66.00.*



Publications

Chemistry and the environment

The December 1992 issue of *International Newsletter on Chemical Education* (No. 38) focuses on 'Chemistry and the Environment'. It includes the following articles and reports:

- Chemistry and sustainable development: CHEMRAWN VIII, Moscow, September 1992 (Michael Freemantle, IUPAC Secretariat, Oxford, UK)
- Global environmental protection and environmental education: Participation of Japan and other Asian countries (K. Fuwa, University of Tokyo, Japan)
- Lead in petrol: Recent developments in New Zealand (B. W. Graham, Institute of Environmental Health and Forensic Sciences, Auckland, New Zealand)
- Air pollution problems in Brazil (T. Tavares, Universidade Federal da Bahia, Savador, Brazil)
- Water pollution problems in the Indian sub-continent, with special reference to the Ganga Action Plan (B. K. Handa, National Environment Engineering Research Institute, Nehru Marg, Nagour, India)
- Less polluting technologies, regrowing resources and recycling: New topics in the teaching of chemistry (H. J. Bader, Johann Wolfgang Goethe-Universitat, Frankfurt am Main, Germany)
- Chemical ideas and the environment (D. J. Waddington, University of York, UK)
- Learning chemistry through environmental contexts (W. G. Burton and M. Aitken, University of York, UK).

The International Newsletter on Chemical Education *is published by the IUPAC Committee on Teaching of Chemistry and edited by Dr Peter Towse, University of Leeds, UK.*

This muddy water-hole has to serve a whole African village. Water pollution is one of the topics featured in the most recent issue of *International Newsletter on Chemical Education*. (*WHO Photo by J. Magee.*)

Enzyme nomenclature

Enzyme Nomenclature: Recommendations (1992) of the Nomenclature Committee of the International Union of Biochemistry and Molecular Biology is the 6th complete edition of *Enzyme Nomenclature* published under the auspices of IUBMB (formerly the International Union of Biochemistry). It is a revision of Recommendations (1984) of the Nomenclature Committee of IUB. The new edition was prepared for the IUBMB Nomenclature Committee by Edwin C. Webb in consultation with members of the IUBMB–IUPAC Joint Commission of Biochemical Nomenclature.

The following is a summary of the contents:

- Historical introduction
- Classification and nomenclature of enzymes
  1. General principles
  2. Recommended and systematic names
  3. Scheme of classification and numbering of enzymes
  4. Rules of classification and nomenclature
- Enzyme List
  1. Oxidoreductases
  2. Transferases
  3. Hydrolases
  4. Lyases
  5. Isomerases
  6. Ligases
- Nomenclature of electron-transport proteins
- Nomenclature of multienzymes
- Glossary of chemical names
- Index of enzyme names

Enzyme Nomenclature Recommendations 1992 *was prepared for NC-IUBMB by Edwin C. Webb and published by Academic Press, Inc., San Diego, California, USA, 1992. xiii + 863 pp. ISBN 0-12-227164-5 (Hardcase); 0-12-227165-3 (Paper). Price: GBP 59.50/USD 95.00 (Hardcase); GBP 34.00/USD 55.00 (Paper).*

UNEP Technical Report

Technical Report No. 11, published by the United Nations Environment Programme Industry and Environment Programme Activity Centre (UNEP IE/PAC) has the title 'From Regulations to Industry Compliance: Building Institutional Capabilities'.

Most countries now have environmental laws and regulations to provide at least minimum environmental standards for industry. The environmental performance of companies which go above and beyond these should always be encouraged. But governments also need to make sure that all companies, local or multinational, are equally complying with these standards to ensure the effectiveness and equity of environmental protection laws.

This new publication provides government officials and other concerned actors with some guidance on building institutional capabilities to implement their environmental laws with an integrated approach so that waste and pollutants are not simply transferred between air, water and land, but are actually reduced at source. It offers some ideas and concepts that can be adapted to local social, economic and political situations to legally bind industrial facilities to established environmental standards to check that they are meeting them. It shows, through examples of some countries' experiences, that incremental steps can be taken with even minimal personnel and resources when there is sufficient political will.

The report is divided into 6 sections. Part 1 provides a brief introduction. Part 2 sets the background of the policy planning, legislation, standard setting, permitting, implementing, enforcing cycle. Part 3 introduces the concept of integrated pollution control. Part 4 examines more closely the stage of establishing a permitting procedure. Part 5 looks at checking that the industrial facility is meeting the standards elaborated upon in its pollution permit and some of the essential elements of effective industrial inspectorates. Part 6 gives a general idea of the minimum resources an inspectorate requires, and some ways in which its costs can be covered.

Examples of the types of industrial activities which are controlled by certain countries and the European Community are given in the appendices. Actual examples of permits and procedures are also provided.

It is UNEP IE/PAC's hope that this technical report will help countries in their implementation of Agenda 21 and other decisions taken by governments at the UNCED Earth Summit in June 1992.

Technical Report No. 11: *From Regulations to Industry Compliance: Building Institutional Capabilities* is published by UNEP IE/PAC, Paris, France, 1992. ISBN 92-807-1342-X; UN Sales No. E92-111-1-11. pp. 62, *Price FRF 200. Available from UNEP IE/PAC, 39-43 quai André Citroën, 75739 Paris, France. Telex: 204997; Fax: +33 (1) 40 58 88 74. Also available from UN Publications, CH 1211 Geneva 10, Switzerland, or New York, NY 10017, USA.*

Water calendar

Conscious of the need to encourage the exchange of information in both developed and developing countries, and following the recommendations of its member states, UNESCO's International Hydrological Programme (IHP), during its fourth phase, decided to put particular emphasis on the management of water-related information.

The goal of the IHP project on water-related information is to provide and promote methodologies and assist in the establishment and development of water-related information systems at national and international levels, in order to render accessible existing information necessary for the study of water resources.

The *Water Calendar* is a contribution of the water-related non-governmental organizations joining forces under the Committee on Water Research (COWAR), which was created by the International Council of Scientific Unions (ICSU) and the Union of International Technical Associations (UITA) in 1964. The role of COWAR is to promote necessary contacts between the professional international non-governmental water-oriented organizations, and to stimulate inter-relationships and integrative approaches where society asks for combined involvement of various specializations.

A database has been set up using the UNESCO Computerized Documentation Systems/Integrated Set of Information Services (CDS/ISIS). CDS/ISIS is able to build and manage structured non-numerical databases whose major constituent is text. The CDS/ISIS package is distributed free of charge by UNESCO. For the time being, the calendar is being distributed in the form of a printed document twice a year, but it is planned that it will be accessible at a later stage through networks on-line.

Further information from: IHP Secretariat, UNESCO (United Nations Educational, Scientific and Cultural Organization), 7, Place de Fontenoy, 75700 Paris, France. Tel.: +33 (1) 45 68 40 02. Fax: +33 (1) 45 67 58 69. Telex: 204461 Paris. E-Mail: SCSZOaFRUNES21. Cable: UNESCO Paris.

Critical technologies

The report *Critical Technologies: The Role of Chemistry and Chemical Engineering* was commissioned in the USA by the Board on Chemical Sciences and Technology of the National Research Council. Written by 24 chemists and chemical engineers, the report underscores the importance of chemical and chemical engineering research for technologies that are deemed critical to the economy, security and well-being of the USA.

The report covers a wide range of vital technologies that are heavily reliant or critically dependent on chemical or chemical engineering research. The chapter headings are: Materials and manufacturing; Energy and transportation; Public Health; Information and Communication; and Environment.

The report is available from: Board on Chemical Sciences and Technology, National Research Council, 2101 Constitution Avenue, NW Washington, DC 20418, USA.

Safe use of pesticides

The 14th Report of the World Health Organization (WHO) Expert Committee on Vector Biology and Control (WHO Technical Report Series, No. 813) is entitled *Safe use of pesticides*. The report records a number of recommendations and conclusions concerning the risks to human health posed by the use of pesticides and the precautions needed to protect both exposed workers and the general public. The report provides concise information on a selection of topics in line with recent advances in knowledge, including improved understanding of the toxicology of pesticides. Both general recommendations and recommendations specific to individual pesticides are included.

The opening section, which reviews trends in pesticide use, notes that chemical pesticides will continue to play a dominant role in vector control, particularly in view of the recent resurgence of vector-borne diseases. Alternatives to chemical control are also briefly reviewed. Other sections outline various international activities for promoting pesticide safety and describe the WHO Pesticide Evaluation Scheme, a four-phase programme of evaluation and testing intended to facilitate industry's efforts to introduce safe and effective new compounds.

A section devoted to recent research on the safety of pesticides summarizes toxicological data on the pyrethroids, deet, chemical larvicides applied to drinking-water, and mutant bacteria used in the biological control of larvae. The pyrethroids are noted to be remarkably free from adverse effects. Whereas use of deet as an insect repellent in adults is judged safe, the report recommends that application to children's skin be kept to a minimum.

Other sections discuss recommended procedures for aircraft disinfection, establish basic principles for the risk management of household pesticides, and issue advice on the labelling of pesticide containers and the special circumstances under which some types of containers can be safely reused. The remaining sections discuss ways to improve training courses for pesticide users, summarize advances in methods for monitoring human exposure to pesticides, and call for urgent action to reduce the severe problems caused by acute pesticide poisoning in developing countries.

The report concludes with concise guidelines for the treatment of poisoning due to organophosphorus, carbamate, and organochlorine insecticides, anitcoagulant rodenticides, and paraquat.

Safe Use of Pesticides: *14th Report of the WHO Expert Committee on Vector Biology and Control (Technical Report Series No. 813) is published by WHO, Geneva, Switzerland, 1991. iv + 27 pp. ISBN 92 4 120813 9. Price: CHF 6.00/ USD 5.40. In developing countries CHF 4.20. Order No. 1100813.*

Drug safety

International Reporting of Periodic Drug-Safety Update Summaries is the Final Report of Working Group II of the Council for International Organizations of Medical Sciences (CIOMS).

The purpose of the CIOMS Working Group II was to provide a satisfactory way, using few resources, for companies to report safety information to regulatory bodies, and to elaborate uniform procedures that should meet most existing and future needs so that future regulatory requirements could be based on these procedures. The Group concentrated on safety updates required by many regulatory authorities periodically after a product is approved.

International Reporting of Periodic Drug-Safety Update Summaries: Final Report of CIOMS Working Group II *was published by CIOMS, Geneva, Switzerland, 1992. ISBN 92 9036 053 4. Price CHF 15.-. CIOMS publications may be obtained directly from CIOMS, c/o World Health Organization, Avenue Appia, 1211 Geneva 27, Switzerland.*

Water and health

Water-borne diseases are the main cause of 14.6 million deaths annually in developing countries of children under the age of 5 years and out of the total, 3.6 to 4 million are diarrhoea-related. The humid tropics are made up mostly of developing countries, and 50% of the people still have *no reasonable* access to a safe water supply and approximately 75% have inadequate sanitation facilities.

The continued escalation in population will only exacerbate the problem. Consequently, the publication of this document is a timely reminder of probably the most critical people-water issue in the humid tropics. The document systematically covers the various water-borne diseases in detail, the role of health care, the linkage between demography and the declining potable water supply and the prospects for sustainable health through better water management, community awareness and participation.

Water and Health *(IHP Humid Tropics Programme Series, No. 3) is published by UNESCO. 48 pp. 1992. Free copies can be obtained from: The Director, Division of Water Sciences, UNESCO, Place de Fontenoy, 75700 Paris. France.*

A primary health care worker explains the benefits of basic hygiene to a young mother in a Guayaquil slum, Ecuador. About 50% of the population in developing countries have no reasonable access to a safe water supply and approximately 75% have inadequate sanitation facilities. (*UNICEF Photo by Bernard Pierre Wolff)*

AOAC International Methods

AOAC International (formerly the Association of Official Analytical Chemists) is a professional scientific association whose primary purpose is to promote chemical and biological methods validation and quality measurements in the analytical sciences. In addition to its method validation programs, AOAC International produces a variety of publications, conducts meetings, and offers educational short courses, workshops, and topical conferences.

During 1992, AOAC International adopted 33 analytical methods for use by scientific laboratories. Each method underwent collaborative study and the AOAC peer review process.

The most recently adopted methods and revisions are published in their entirety in the fourth supplement (1993) to the 15th Edition of *Official Methods of Analysis of the AOAC*. The collaborative studies of AOAC methods, which include the data that support adoption of the method, the method itself, and a discussion of the study, are published in the *Journal of AOAC International*.

The 15th edition (1990) of *Official Methods of Analysis*, together with its supplements, comprise the methods of the Association. Methods adopted in 1992 are grouped into the following subject areas: Pesticide formulations; Pesticide and industrial chemical residues; Veterinary analytical toxicology; Extraneous materials: isolation; Microbiological methods; Drugs; Malt beverages and brewing materials; Cereal foods; Dairy products; Fruits and fruit products; Meat and meat products; Vitamins and other nutrients.

For further information, contact AOAC International, Technical Services Department, 2200 Wilson Blvd., Suite 400, Arlington, VA 22201-3301; Tel.: + (703) 522 3032. Fax: + (703) 522 5468.

Keeping chemicals off the front page

A road or rail tanker that transports chemicals safely to their destination does not make the news – it is an everyday occurrence – but on the less frequent occasions when chemicals are the cause of a fire, pollution of a river, or the emergency evacuation of a neighbourhood, this usually makes the front page.

Knowing how to deal with the particular chemical product involved in a road spill, or released accidentally into the environment from a chemical plant, or simply, the correct procedures to be followed for transporting, handling and storing chemical drums awaiting shipment from a port, is crucial not only to the emergency services, but to all in the chain from supplier to client.

International Organization for Standardization (ISO) Technical Committee (ISO/TC 47), Chemistry, has been working to ensure that the essential data is communicated in as clear, coherent and efficient manner as possible. In the draft International Standard ISO/DIS 11014, Safety data sheet for chemical products – Content and order of sections, it has developed a standardized method of presenting basic information on the chemical product, concerning safety, health and environmental aspects, and giving recommendations on protective measures and emergency procedures.

Correct procedures for transporting, handling and storing chemicals awaiting shipment from a port is crucial not only to the emergency services but to all in the chain from supplier to client.

The safety data sheet (SDS) – which is known in some countries as a material safety data sheet (MSDS) – is for worldwide application. TC 47 recognizes that there may be national or local regulatory requirements in certain countries and recommends that information on these is made available to all those responsible for preparing SDSs. The goal is the establishment and acceptance of a single SDS per chemical product for use internationally.

ISO/DIS 11014 leaves the actual format of the SDS up to the supplier, but defines the contents and general layout to be followed. The SDS comprises the following 16 standard headings, the wording, numbering and the sequence of which is to be adhered to: 1. Chemical product and company identification; 2. Composition/information on ingredients; 3. Hazards identification; 4. First aid measures; 5. Firefighting measures; 6. Accidental release measures; 7. Handling and storage; 8. Exposure controls/personal protection; 9. Physical and chemical properties; 10. Stability and reactivity; 11. Toxicological information; 12. Ecological information; 13. Disposal considerations; 14. Transport information; 15. Regulatory information; 16. Other information.

Relevant information is to be provided under each of the 16 headings in a clear and concise manner, employing commonly used phrases and a language acceptable to the recipient. If information is not available under a particular heading, then it should be stated why this is not so – blanks should not be left.

ISO/DIS 11014 defines the procedures to be followed with regard to page numbering and dating with SDS, to avoid problems such as, 'Is there a page missing?', or 'Is this the latest version?', and provides instructions for compiling and completing the information required under each standard heading. In order to avoid errors of misinterpretation, standardized, preferred wording is recommended, although it is not obligatory.

It is the obligation of the supplier of the chemical product to keep the associated SDS up to date and through this medium, to provide the recipient with relevant information on safety, health and environment. Although the obligations of the recipient go beyond the scope of this standard

and are not, therefore, spelled out, TC 47 includes under, 'General aspects', the reminder that the recipient is responsible for taking necessary measures in a given work situation and has the obligation of keeping workers informed about the hazards relevant to their individual workplace. When formulating these specific instructions, the recipient should consider the recommendations of the relevant SDSs.

TC 47 adds, 'Since an SDS is merely product-related, in no way can an SDS take into account all possible situations at any given workplace. Therefore, an SDS only constitutes part of a safety programme.'

From: *ISO Bulletin*, Vol. 24, No. 2, pp. 9–10, February 1993.

ISO Standards

The following are some of the new international standards announced by the International Organization for Standardization (ISO) in recent issues of *ISO Bulletin*:

February 1993 issue of *ISO Bulletin*:

TC 12	**Quantities, units, symbols, conversion factors**
ISO 31-8:1992	Quantities and units – Part 8: Physical chemistry and molecular physics
ISO 31-11:1992	Quantities and units – Part 11: Mathematical signs and symbols for use in the physical sciences and technology
TC 28	**Petroleum products and lubricants**
ISO 4259:1992	Petroleum products – Determination and application of precision data in relation to methods of test
TC 35	**Paints and varnishes**
ISO 8130-5:1992	Coating powders – Part 5: Determination of flow properties of a powder/air mixture
TC 37	**Terminology (principles and coordination)**
ISO 10241:1992	International terminology standards – Preparation and layout
TC 42	**Photography**
ISO 10349-1:	Photography-grade chemicals – Test methods – Part 1: General
ISO 10349-2:	Photography – Photographic-grade chemicals – Test methods – Part 2: Determination of matter insoluble in water
ISO 10349-3: 1992	Photography – Photographic-grade chemicals – Test methods – Part 3: Determination of matter insoluble in ammonium hydroxide solution
ISO 10349-4: 1992	Photography – Photographic-grade chemicals – Test methods – Part 4: Determination of residue after ignition
ISO 10349-5: 1992	Photography – Photographic-grade chemicals – Test methods – Part 5: Determination of heavy metals and iron content
ISO 10349-6:1992	Photography – Photographic-grade chemicals – Test methods – Part 6: Determination of halide content
ISO 10349-7:1992	Photography – Photographic-grade chemicals – Test methods – Part 7: Determination of alkalinity or acidity
ISO 10349-8:1992	Photography – Photographic-grade chemicals – Test methods – Part 8: Determination of volatile matter
ISO 10349-9:1992	Photography – Photographic-grade chemicals – Test methods – Part 9: Reaction to ammoniacal silver nitrate
ISO 10349-10:1992	Photography – Photographic-grade chemicals – Test methods – Part 10: Determination of sulfide content
ISO 10349-11:1992	Photography – Photographic-grade chemicals – Test methods – Part 11: Determination of specific gravity
ISO 10349-12: 1992	Photography – Photographic-grade chemicals – Test methods – Part 12: Determination of density
TC 44	**Welding and allied processes**
ISO 10042:1992	Arc-welded joints in aluminium and its weldable alloys – Guidance on quality levels for imperfections
TC 45	**Rubber and rubber products**
ISO 4656-1:1992	Rubber compounding ingredients – Carbon black – Determination of dibutyl phthalate absorption number – Part 1: Method using absorptometer
TC 61	**Plastics**
ISO 6427:1992	Plastics – Determination of matter extractable by organic solvents (conventional methods)
ISO 10365:1992	Adhesives – Designation of main failure patterns
TC 175	**Fluorspar**
ISO 9062:1992	Acid-grade and ceramic-grade fluorspar – Determination of manganese content – Periodate spectrometric method

March 1993 issue of *ISO Bulletin*

TC 35	**Paints and varnishes**
ISO 3231:1993	Paints and varnishes – Determination of resistance to humid atmospheres containing sulfur dioxide
TC 42	**Photography**
ISO 6:1993	Photography – Black-and-white pictorial still camera negative film/process systems – Determination of ISO speed
ISO 3943:1993	Photography – Processing chemicals – Specifications for anhydrous sodium acetate
ISO 6077:1993	Photography – Photographic films and papers – Wedge test for brittleness
ISO 7766-1:1993	Photography – Processing wastes – Analysis of cyanides – Part 1: Determination of hexacyanoferrate(II) and hexacyanoferrate(III) by spectrometry
ISO 10348:1993	Photography – Processing wastes – Determination of silver content
TC 61	**Plastics**
ISO 2039-1:1987	Plastics – Determination of hardness – Part 1: Ball indentation method
ISO 2078:1993	Textile glass – Yarns – Designation
TC 79	**Light metals and their alloys**
ISO/TR 11728:1992	Anodized aluminium and aluminium alloys – Accelerated test of weather fastness of coloured anodic oxide coatings using cyclic artificial light and pollution gas
TC 134	**Fertilizers and soil conditioners**
ISO 8603:1993	Solid fertilizers – Determination of urea nitrogen content – Gravimetric method using xanthydrol
TC 146	**Air quality**
ISO 8672:1993	Air quality – Determination of the number concentration of airborne inorganic fibres by phase contrast optical microscopy – Membrane filter method
TC 175	**Fluorspar**
ISO 4283:1993	All grades of fluorspar – Determination of carbonate content – Titrimetric method
ISO 4284:1993	Acid-grade and ceramic-grade fluorspar – Determination of sulfide content – Iodometric method

IUPAC President Yves Jeannin speaking at the London conference.

Chemistry and developing countries

Chemistry and developing countries is the outcome of an international conference organized by the Royal Society of Chemistry on this topic. The conference was held in London, UK in April 1991 (see *Chem. Intl.*, **13**, 193–6, 1991).

The conference addressed issues relating to chemistry for the environment and the organisation of science to benefit the Third World. These are complex matters and were discussed in the light of rapidly changing economic and political climates, and the emergence of global issues with a chemical component such as CFCs and AIDS. The papers presented at the conference and published in this volume are wide-ranging, covering many areas of sustainable development, wealth creation and institution building, as well as providing ideas on the effective use of science in safeguarding health and the environment.

Scientists, technologists, industrialists and development experts, many of whom are advisers to governments and aid agencies contributed both to the conference and to this volume. The 33 papers published in this volume include the following three keynote talks:

- Chemists: sinners or saviours (A. J. Bennett, Overseas Development Administration, UK)
- IUPAC and its role in development (Y. P. Jeannin, President, IUPAC)
- Chemistry, UNESCO and development (F. Mayor, Director General, UNESCO).

The book should appeal to all those wishing for an honest appraisal of past mistakes and for an enlightened approach towards the scientific and development needs of the Third World.

Chemistry and Developing Countries: Proceedings of a Conference, London, April 1991, *is edited by D. I. Coomber, S. S. Langer and J. M. Pratt. London, UK, and published by the Commonwealth Science Council and The Royal Society of Chemistry, December 1992, iv + 203 pp. Series Number CSC(92)EPP-18, Technical Publication 297. ISBN 0-85092-395-6. Price: GBP 6.00 or USD 11.00 in UNESCO coupons. Available from: The Royal Society of Chemistry (International Affairs Department), Burlington House, Piccadilly, London W1V OBN, UK, or Commonwealth Secretariat Publications, Marlborough House, Pall Mall, London SW1Y 5HX, UK.*

Pesticides and their application to pest control

Recent developments in the field of pesticides and their application to pest control is a UNIDO (United Nations Industrial Development Organization) publication prepared in collaboration with the Regional Network on Pesticides for Asia and the Pacific (RENPAP). The publication is based on an international seminar on 'Recent Developments in the Field of Pesticides and their Application to Pest Control in China and other Developing Countries of the Region'. The Seminar was held at Shenyang, People's Republic of China in 1990.

According to the book's introduction, without pesticides mankind would continue to lose a third of its food production due to pests and most of this loss would continue to take place in the developing countries where food is needed most. During the last 25 years, pesticide technology has gone through a revolutionary change and is moving from bulk chemicals to speciality or fine chemicals. These changes include the invention of highly active pesticides newer and safer formulations and novel application techniques. Complex data are required for the registration of pesticides and to recognize problems related to pest resistance and damage to the environment owing to misuse of pesticides.

The Seminar marked the inauguration of new facilities for pesticide research at the Shenyang Research Institute of Chemical Industry. This Institute was found in 1949 and was one of the earliest chemical research organizations for industry in China, covering many needs. Research and development of pesticides began there in 1952. Many activities have since devolved to other centres and today the research concentrates on pesticides, dyestuffs and other fine chemicals.

A programme of assistance by UNDIO and UNDP (United Nations Development Programme) and the UK Government was evolved and included help through technical visits, training fellowships and provision of equipment. The Chinese Government committed large resources to buildings, services and staffing. The first phase provided modern facilities for toxicology and safety evaluation of pesticides. The second phase, now completed, provides facilities for the biological evaluation of new pesticides in laboratory and glasshouse experiments. In the Institute, as a whole, the research spans the spectrum of discovery and synthesis of novel pesticides together with investigation of performance, safety, formulation and analysis.

China has lived continuously with a pressing need to increase farm production by controlling pest, disease and weed problems in agriculture and to control insect problems in public health. This has provided the stimulus through the last four decades to increase pesticide production and use. In recent years a particular influence has been the desire to phase out use of chlorinated hydrocarbon insecticides and replace them with efficient alternatives. Thus the Seminar provided a most timely opportunity to bring together this Chinese experience with that of the wider region and to interact with other experts from around the world. The Seminar was attended by delegates from China and 17 other countries.

Without pesticides mankind would continue to lose one third of its food production due to pests. Most of this loss would take place in developing countries where food is needed most. (*FAO photo by F. Paladini*)

The proceedings include all the papers and posters presented at the Seminar. Many facets of pesticide research and development and their inclusion in integrated pest management systems are covered. In addition, the whole spectrum of the pesticide scenario is dealt with, including likely future developments in the 21st century, and should prove a valuable publication for the benefit of college, universities, R & D institutions, industries, national and international organizations dealing with pesticides.

Recent Developments in the Field of Pesticides and their Application to Pest Control *edited by K. Holly, L. G. Copping and G. T. Brooks is published by UNIDO in collaboration with RENPAP, 1993. Price USD 65.00. Please send orders to: Regional Coordinator, Regional Network on Pesticides for Asia and the Pacific (RENPAP), UNIDO/UNDP, D-62, Defence Colony, New Delhi-110 024, India.*

Databases: water and the environment

Information related to water and the environment: databases available on-line and on CD-ROM includes a directory of water-related databases. It is divided into two categories: the CD-ROM databases and accessible on-line databases. Several databases, including full-text, bibliographic, referral and numeric databases are considered.

This publication demonstrates the wide variety of water-related databases available. Each database has its own literature sources, but there is extensive overlapping of sources between databases.

Information related to water and the environment: databases available on-line and on CD-ROM *by F. Provost, P. Nieuwenhuysen and W. W. de Mes (IHP-IV Projects M-2.1 and M-2.2) is published by UNESCO. 136 pp. 1992. English. Free copies can be obtained from: The Director, Division of Water Sciences, UNESCO, Place de Fontenoy, 75700 Paris, France.*

News & Views

Clinical chemists in Kenya

In 1990, the Clinical Chemistry Association of Kenya hosted the 4th African, Mediterranean and Near East Congress of Clinical Chemistry at the Kenyatta Conference Centre in Nairobi. Concurrently with this programme, the World Health Organization (WHO) organized an external quality assurance workshop. As a consequence, the late Norberto Montalbetti, who was then the President of the Clinical Chemistry Division of IUPAC made an application to the International Council of Scientific Unions (ICSU) for money on behalf of IUPAC to follow this by a further programme. In 1991 ICSU awarded a grant for this purpose.

Meanwhile, Callum Fraser, Clinical Biochemist at the Ninewells Hospital and Medical School, Dundee, UK, and a retired member of the IUPAC Clinical Chemistry Teaching Commission, had been nominated as the International Federation of Clinical Chemistry (IFCC) Visiting Lecturer for 1993 to Uganda and Kenya. It therefore seemed appropriate to combine these two occasions into one workshop, which would also be a most fitting memory to Norberto Montalbetti because of the enormous amount of work that he had done for both organizations.

The workshop entitled 'Kenya Quality Assurance Workshop' took place on 25–29 January 1993 in the Silver Springs Hotel, Nairobi. Callum Fraser was joined by Des Geary, Vice-President of the IUPAC Clinical Chemistry Division and Howard Worth, member of the Division Committee. The theme of the workshop was 'Total Quality Management' with particular reference to establishing an

external quality assessment scheme for the hospital laboratories in Kenya.

There were nearly 40 participants, mostly senior hospital laboratory staff, representing all aspects of the hospital laboratory service from the Kenyatta National Hospital to provincial and district hospitals and private hospitals. There were representatives from Uganda, Tanzania and Zimbabwe who shared their experiences with the other participants, particularly in relation to the problems of quality management in general, and external assessment programmes in particular. If the success of a workshop is judged by the enthusiasm of the participants and the standard of the discussion precipitated by the presentations, then this was a successful workshop.

This programme was largely facilitated by the ICSU grant, indeed the workshop would not have been possible without it. We hope that it will enable the Clinical Chemistry Association of Kenya, with support from the Ministry of Health, to establish an external quality assessment programme and that it will be possible to give some follow-up and support, through IUPAC and IFCC. This will undoubtedly be needed in the early days, as that has been the experience of establishing similar programmes in other countries.

Thanks are due to Donald Orinda of the Department of Clinical Chemistry at the University of Nairobi and the Kenyatta National Hospital who acted as co-ordinator and who, along with his team of supports, organized the workshop and ensured it ran so smoothly. This was truly an example of collaboration between international bodies with an effective outcome at a national level.

Howard Worth

New IUPAC members

IUPAC has accepted applications for full membership from the following countries: Croatia, Czech Republic, Slovakia and Slovenia. The National Adhering Organizations of these countries are, respectively:

- Croatian Chemical Society (Marulicev trg 19/II, PO Box 163, 41001 Zagreb, Croatia);
- Czech National Committee for Chemistry (Ustav Makromolekulárni Chemie, Ceskoslovenská Akademie Véd, Heyrovského námésti 2, CS-162 06 Praha 6, Czech Republic);
- Slovak National Committee for Chemistry (Polymer Institute, Slovak Academy of Sciences, Dubravska cesta 9, 842 36 Bratislava, Slovak Republic);
- Slovenian Chemical Society (Hajdrihova 19, 61115 Ljubljana, Slovenia).

Amount-of-substance, chemical amount, molar amount or molance? Author?

Every author knows that it is possible to write a piece, rewrite it, check it, proof read it and still allow the most blatant error to go through unnoticed until after publication. Similarly with editors: on page 64 of the March 1993 issue of *Chemistry International* we published a letter which asked the question 'Amount-of-substance, chemical amount, molar amount or molance?' We even illustrated the letter with a cartoon showing a chemist examining a chemical amount. Unfortunately, and for some inexplicable reason, we omitted the name of the author of the letter. We can only suggest that this was a new form of 'author blindness' which afflicts editors.

The author was J. Christopher Rigg, Langhoven 57, 6721 SL Bennekom, Netherlands. Tel.: +31 (8389) 19373. Telex: 45015 BLUWG NL. Fax: +31 (8370) 84761 (PUDOC).

Our sincere apologies to J. Christopher Rigg for this embarrassing error.

Names and Addresses

Full details (names, addresses, telephone/telex/fax numbers) of commission and committee chairmen and secretaries and IUPAC officers were published in *Chem. Intl.* **13**, 223-233 (1991). The IUPAC Secretariat has been notified recently of the following changes:

Prof. John CORISH (Chairman, Commission on High Temperature and Solid State Chemistry, II.3). Tel.: +353 (1) 7021776. Fax: +353 (1) 712826.

Prof. Gerrit DEN BOEF (Secretary General). Fax: +31 (20) 5256638.

Dr Roy GREENHALGH (Secretary, Applied Chemistry Division Committee). Xenos Laboratories Inc., 2319 St.-Laurent Boulevard, Unit 100, Ottawa, Ontario, K1G 4K6, Canada.

Dr Patrick HOLLAND (Chairman, Commission on Agrochemicals, VI.5). Tel.: +64 (7) 856 2835. Fax: +64 (7) 838 5085.

Mr Mogens LAURITZEN (Secretary, Commission on Quantities and Units, VII.2). Novo Nordisk A/S, Roskildevej 56, DK-3400 Hillerod, Denmark. Tel.: +45 4824 4488. Fax: +45 4824 1795.

Prof. Joachim WENDORFF (Chairman, Limited Lifetime Commission on Functional Polymers). Fachbereich Physikalische Chemie, Hans-Meerwein-Strasse, Philipps Universität, 3550 Marburg, Germany. Tel.: +49 (6421) 285964. Fax: +49 (6421) 28 5551.

We regret to record the deaths of

Prof. I. M. Kolthoff, USA (4 March 1993) – President of Analytical Chemistry Division (1953–57)/Vice-President (1949–53)/Member (1957-59, 1971–75), Commission on Physicochemical Data of Analytical Interest (1951–55), Commission on Analytical Nomenclature (1959–61), Commission on Electrochemical Data (1961–63), Commission on Electroanalytical Chemistry (1963–71).

Prof. S. Siggia, USA (15 October 1992) – Commission on Analytical Reactions and Reagents (1968–77).

Affiliate Affairs

Information for Affiliates

How to contact commissions

IUPAC affiliates are entitled to communicate directly on scientific matters with the officers of IUPAC commissions. A full list of names and addresses of all commission officers for 1991–93 was published on pages 223–233 of the November 1991 issue of *CI*. Photocopies of this list are available upon request from the Affiliate Affairs Secretary.

IUPAC-sponsored conferences

If you are interested in attending a conference please apply directly to the conference organizers for the conference circulars and registration forms. An updated list of names and addresses of the organizers of all future IUPAC-sponsored conferences is given in the 'Conference Calendar' published in each issue of *CI*.

Affiliate reduction of conference registration fees

It is a condition of IUPAC sponsorship of a conference that IUPAC affiliates are entitled to a 10% reduction or 'own members' rate on the registration fee for scientific participants. This concession is usually – but not always – announced in the conference circulars and indicated on the registration form.

To receive this reduction an affiliate must declare on the conference registration form that (s)he is an affiliate. Alternatively the affiliate should apply in writing to the conference organizer for this reduction stating that (s)he is an affiliate. Conference organizers may check with the IUPAC Secretariat that applicants for this reduction are currently registered as affiliates.

If an application for this reduction is refused, an affiliate should immediately notify the Affiliate Affairs Secretary and, if possible, forward copies of documentary evidence of this refusal

Ties and scarves

IUPAC ties and scarves may be purchased from the IUPAC Secretariat by applying to the Affiliate Affairs Secretary. The colours for both are *either* maroon *or* navy (dark) blue. The ties cost USD 14.00/GBP 7.00 each and the scarves USD 12.00/GBP 6.00 (including postage and packing).

Please use the form (or a photocopy of it) published on page 170 of the September 1992 issue of *CI*. Alternatively please write to the Affiliate Affairs Secretary with your order stating the colour you require. A cheque made payable to IUPAC for the appropriate amount should be enclosed with your order.

Address of IUPAC Secretariat

Please use the following address for all communications directed to the IUPAC Affiliate Affairs Secretary. If you are submitting a letter for publication in Chemistry *International* (*CI*), please indicate that the letter is 'Submitted for publication in *CI*.'

Affiliate Affairs Secretary
IUPAC Secretariat
Bank Court Chambers
2–3 Pound Way
Templars Square
Cowley
Oxford OX4 3YF
UK

Tel.: +44 (865) 747 744
Fax: +44 (865) 747 510
Telex: 83147 VIA OR G
attn. IUPAC
E-mail: IUPAC@VAX.
OXFORD.AC.UK.

IUPAC publications

Affiliates are entitled to a 25% reduction and in some cases a 40% reduction on the cost of IUPAC publications except the scientific journal *Pure and Applied Chemistry*. A leaflet detailing IUPAC books currently available from Blackwell Scientific Publications has recently been distributed by the publishers to all *CI* readers. Further copies may be obtained from the IUPAC Secretariat.

IUPAC poster

Copies of an IUPAC poster (see page 214 of the November 1990 issue of *CI*) are available **free of charge** to affiliates and members of IUPAC's commissions and committees. The poster is printed in maroon and black on a white background and is approximately 42 × 59 cm in size.

IUPAC welcomes any publicity you can give to its activities. If you would like to display one or more copies of the poster in your department or elsewhere please write to the Affiliate Affairs Secretary stating your name and address and how many copies of the poster you wish to receive.

UNESCO water documents

The Division of Water Sciences, UNESCO, has recently published two documents on water which are available free of charge: (1) *Water and Health*, and (2) *Information related to water and the environment: databases available on-line and on CD-ROM*. For further information see pages 136–7.

IUPAC General Assembly

IUPAC General Assemblies are held in odd-numbered years. This year, the 37th General Assembly will take place in Lisbon, Portugal, during August.

Prof. Filomena Camoes is Executive Secretary of the local Organizing Committee.

IUPAC's General Assemblies are held every other year. They consist of a set of meetings of IUPAC's Council, Bureau, Commissions and Committees. At any one time over 30 meetings may be taking place simultaneously. Only members of IUPAC bodies (such as Commissions and Committees), National Representatives and invited observers may attend these meetings.

The 37th IUPAC General Assembly is hosted by the Sociedade Portuguesa de Química (Portuguese Chemical Society) and the Department of Chemistry of the Faculty of Sciences of the University of Lisbon. The Organizing Committee is chaired by Prof. J. A. Martinho Simoes, Secretary General of the Portuguese Chemical Society. Prof. C. A. Nieto de Castro, Dean of the Scientific Council of the Faculty of Sciences, is the Vice-Chairman. The Executive Secretary of the local Organizing Committee is Prof. F. C. Camoes.

The General Assembly will take place in the buildings of the Faculdade de Ciências da Universidade de Lisboa during the period 5–12 August. The Faculdade de Ciências is located in Campo Grande, about 3 km from the airport and 4 km from Lisbon city centre.

Although there will be some meetings on 3 and 4 August, the main programme of Commission and Committee meetings will commence on Thursday 5 August and continue through to the morning of Monday 9 August. The Bureau will then meet during the afternoon and on Tuesday 10 August and again on Thursday 12 August. The climax is reached on the 11th and 12th of the month when the Council meets. The Executive Committee also meets on the 12th.

The Bureau acts for the Union during intervals between meetings of the Council. The Council is composed of delegates of the member countries. The Bureau and all the Committees, Divisions and Commissions of IUPAC are responsible to Council.

IUPAC General Assembles

37th	Lisbon (Portugal)	1993
36th	Hamburg (Germany)	1991
35th	Lund (Sweden)	1989
34th	Boston (USA)	1987
33rd	Lyon (France)	1986
32nd	Lyngby (Denmark)	1983
31st	Leuven (Belgium)	1981
30th	Davos (Switzerland)	1979
29th	Warsaw (Poland)	1977
28th	Madrid (Spain)	1975
27th	Munich (FRG)	1973
26th	Washington, DC (USA)	1971
25th	Cortina d'Ampezzo (Italy)	1969
24th	Prague (Czechoslovakia)	1967
23rd	Paris (France)	1965
22nd	London (UK)	1963
21st	Montreal (Canada)	1961
20th	Munich (FRG)	1959
19th	Paris (France)	1957
18th	Zurich (Switzerland)	1955
17th	Stockholm (Sweden)	1953
16th	New York City/Washington DC (USA)	1951
15th	Amsterdam (Netherlands)	1949
14th	London (UK)	1947
13th	Rome (Italy)	1938
12th	Lucerne/Zurich (Switzerland)	1936
11th	Madrid (Spain)	1934
10th	Liege (Belgium)	1930
9th	The Hague (Netherlands)	1928
8th	Warsaw (Poland)	1927
7th	Washington, DC (USA)	1926
6th	Bucharest (Romania)	1925
5th	Copenhagen (Denmark)	1924
4th	Cambridge (UK)	1923
3rd	Lyon (France)	1922
2nd	Brussels (Belgium)	1921
1st	Rome (Italy)	1920

One of the buildings of the Faculty of Sciences of the University of Lisbon.

Portugal

Portugal, one of the oldest nations in Europe, lies along the Atlantic Ocean at its south-western edge of Europe. The name *Portugal* is thought to derive from the Roman settlement of Portus Gale, located on the present site of Porto.

The country is composed of the Meseta, a mountainous interior, and a coastal plain in the west. The Tagus River flows across the country from east to west. Portugal has a variant of the typical Mediterranean climate with the south approaching sub-tropical, semiarid conditions. In August, in Lisbon, temperatures range from 18°C to 27°C with very little if any rainfall.

Portugal is Europe's leading producer of tungsten ore and also has important deposits of coal and copper pyrites. There are also deposits of kaolin, haematite (iron ore), cassiterite (tin ore) and gold. Almost half the land is cultivated.

Most of the country's manufacturing is concentrated in and around Lisbon and Porto. Industries include: metallurgy (iron and steel); shipbuilding and repairs; armaments, agricultural implements, general hardware and textile machinery; textiles; ceramics and glass; fertilizers; insecticides; and other chemicals. Other important products include wines, cork, pulpwood and canned sardines.

The country is famous for its sweet after-dinner wine known as port. This wine is made from grapes grown in the Douro valley of Portugal, near the city of Porto. The wine is fortified – brandy is added to halt fermentation when the process is half complete so that much of the grape sugar remains. The wine is then aged in oak casks and usually blended with wines of different vintages.

Lisbon (in Portuguese: *Lisboa*) is the capital of Portugal and the seat of the Portuguese government. It is the largest city and the main port of Portugal. The city lies on the northern shore of the Tagus River just over 12 km from the Atlantic, on the most western piece of land in Europe. Almost 70% of Portugal's seaborne trade passes through Lisbon. Principal imports are fuel and industrial raw materials. Exports include fish, olive oil, cork and timber.

Lisbon is the country's chief cultural and educational centre. The University of Lisbon was established in 1290 and re-established in 1911. It is the largest university in Portugal.

Council agenda

The following is the agenda for the 37th IUPAC Council Meeting to be held in Lisbon, Portugal on 11–12 August 1993.

1 Introductory Remarks and Finalization of Agenda
2 Approval of Minutes of 36th Council Meeting and Matters Arising
3 Ratification of Decisions Taken by Bureau and Executive Committee since 36th General Assembly
4 Announcement of Nominations for Officers and Bureau Members
5 Announcement of Time of Elections
6 Biennial Report of Treasurer/Report of Finance Committee and Accounts for 1991–92/Appointment of Auditors for 1993–94
7 Statutory Report of President on State of Union
8 Vice-Presidential Critical Assessment of IUPAC Programmes and Projects 1992
9 Restructuring of Union
10 Reports of Division/Section Presidents
11 Continuation/Dissolution of Existing IUPAC Bodies and Proposals for New Bodies/Terms of Reference
12 Report of Publications Committee
13 Report of CHEMRAWN Committee
14 Report of Committee on Chemistry and Industry
15 Report on Affiliate Membership Programme
16 Proposed Changes to Statutes and Bylaws
17 Proposals Formally Received from National Adhering Organizations
18 Ratification of Dates and Places of 38th General Assembly and 35th Congress (1995)
19 Budget Proposal and National Subscriptions for 1994–95
20 Elections and Approval of Elected Officers of Divisions/Section
21 Provisional Places of 39th General Assembly and 36th Congress (1997)
22 Applications for Membership of IUPAC
23 Applications for Associated Organization Status of IUPAC and Review of Existing Associate Organizations
24 Adoption of Recommendations on Nomenclature and Symbols
25 Important Matters Discussed by Bureau at 37th General Assembly Not Covered by Items on Council Agenda
26 Any Other Business (discussion only)

Centre of Lisbon.

ELECTIONS OF OFFICERS AND BUREAU MEMBERS

One of the duties of Council at the 37th IUPAC General Assembly will be to elect Officers of the Union and members of Bureau. Nominations for the various positions that fall vacant in 1993 were required by the Secretary General at the IUPAC Secretariat by 11 June 1993. The following are details of vacancies and candidates who had been nominated by the time this issue went to press (19 April 1993).

Officers

Prof. H. A. Staab (FRG), Vice-President and President-Elect, has advised the Officers of the Union that, due to unforeseen circumstances, he is unable to become **President** on 1 January 1994. This means that Council at Lisbon will have to elect an Officer, who on 1 January 1994 will become President of the Union.

The **Vice-President** to be elected at the 37th General Assembly will be President-Elect, and will become President on 1 January 1996.

The retiring President, Prof. A. J. Bard (USA), will remain a member of the Bureau for a period of 2 years. The **Past-President** is *not* presently an Officer of the Union.

Prof. G. den Boef (Netherlands), the present **Secretary General**, is elected for the period 1991–95.

Prof. J. M. Ward (UK), the present **Treasurer**, is elected for the period 1992–95.

Nomination for President/Vice-President

Prof. Erno Pungor (Hungary)

Erno Pungor was born on 30 October 1923. He earned a Diploma in Chemistry in 1948 and PhD degree in 1949 at Pázmány Péter University in Budapest. He joined the Department of Inorganic and Analytical Chemistry there, first as an Assistant Professor and then, between 1953 and 1962, as an Associate Professor. His next appointment was as full Professor of Analytical Chemistry at the University of Veszprém. In 1970, he was invited to the Technical University of Budapest as Director of the Institute of General and Analytical Chemistry. He served there until 1990 when he was appointed President of the Hungarian Committee for Technological Development and Minister without portfolio.

He has had a continuous and most successful scientific research career achieving fundamentally important results in various fields of analytical chemistry. He is the author of several books and over 500 scientific papers published in the most prestigious journals. He is the editor of the *Hungarian Journal of Chemistry* and is the member of the editorial boards of a number of international chemistry journals. He was awarded the degree of Candidate of Sciences in 1952. In 1967 he was elected a Corresponding Member of the Hungarian Academy of Science and became a Full Member in 1976.

His awards and distinctions include: Honorary Memberships of the Egyptian Pharmaceutical Society (1973), the Austrian Analytical and Microanalytical Society (1977), the Chemical Society of Finland (1979), the Analytical Chemical Society of Japan (1981), the Technical Society of Finland (1990); Honorary Professor of the Agricultural University of Lima, Peru (1973); Recipient of the Robert Boyle Gold Medal (1986), Talanta Gold Medal (1987), Gold Medal of the Hungarian Academy of Sciences (1988), Gold Medal of the Technical University of Vienna (1988).

He has been very active in international organizations. He served as President of the Association of Editors of the European Chemical Journals (1977) and is a member of the International Federation of Scientific Editors Associations. He has also served as Chairman of the Working Party on Analytical Chemistry of the Federation of European Chemical Societies (1981–87) and is Chairman of the Analytical Chemistry Division of the Hungarian Chemical Society and of the Commission of Analytical Chemistry of the Hungarian Academy of Sciences.

He has served IUPAC for a long time in different capacities. Between 1979 and 1987 he was a member of the Commission on Electroanalytical Chemistry, a member of the Subcommittee of Electroanalytical Methods of Environmental Trace Analysis (1983–85) and a co-opted member of the Analytical Chemistry Division (1981–89). Since 1985 he has been the Chairman of the Hungarian National Commission of IUPAC. He was also President of the 33rd IUPAC Congress held in Budapest in 1991.

STOP PRESS: Zamaraev nominated as President (*see* page 161)

Bureau

The Bureau consists of the Officers, the immediate Past-President, the Presidents of the Divisions/Sections, together with not less than ten other members elected by Council, who shall be known as 'Elected Members'. At the conclusion of the 36th General Assembly in Hamburg, there were ten Elected Members of the Bureau. At the 37th General Assembly the Bureau will make recommendations to Council as to the number of Elected Members (ten or more), who should be on the Bureau for the succeeding 2 years.

Elected Members are elected for a period of four years, and they are eligible for election for a second period of four years.

No Adhering Organization shall have more than *one Elected Member* of the Bureau. Statute 7.2 also states that 'the principle of fair geographical representation of Members shall be taken into account'.

• *Elected Members of Bureau, retiring in 1993, who are* not eligible for re-election, but may be nominated for *another office*: Dr. Mary L. Good (USA); Prof. S. Itô (Japan); Prof. W.-Y. Huang (Chinese Chemical Society); Prof. I. Wadsö (Sweden).

• *Elected Members of Bureau, retiring in 1993, who are eligible for re-election for a further four-year period*: Prof. R. D. Brown (Australia); Prof. K. I. Zamaraev (Russia).

• *Elected Members of Bureau, who were elected at the 36th General Assembly until 1995*: Prof. M. T. Beck (Hungary); Prof. J. Jortner (Israel); Prof. A. Chakravorty (India); Prof. G. Modena (Italy).

At least six Elected Members of the Bureau must be elected at the 37th General Assembly in Lisbon, that is, the minimum number of ten Elected Members less the four Elected Members who continue in office until 1995.

Nominations for Bureau

Professor R. D. Brown (Australia)

Professor R. D. Brown was Head of the Chemistry Department at Monash University until 1992. After graduating BSc from Melbourne University and PhD from London University he held lecturing positions at London University (University College) and Melbourne University before being appointed Professor of Chemistry at Monash in 1959. He was awarded the Masson (1948), Rennie (1951) and Smith (1959) Medals of the Royal Chemical Institute, the David Syme Prize for research by the University of Melbourne (1959) the Edgeworth-David Medal of the Royal Society of New South Wales (1961) and the Royal Society Medal of Victoria (1977).

In 1965 he was elected a Fellow of the Australian Academy of Science and has been a member of the Council of the Academy and Vice-President of Physical Sciences. He was elected Secretary of Physical Sciences (Academy of Science) 1976–79. He has been Chairman of the Academy's National Committee for Chemistry, a member of the Sub-Committee on Chemical Education and Chairman of the Committee on Science Policy.

Professor Brown is an internationally known spectroscopist and is active in IUPAC matters, having lead the Australian delegation to General Assemblies of IUPAC since 1981. He was Australian representative for IUPAC's conference on Teaching of Chemistry in Washington a number of years back. Currently he is a member of the Division of Physical Chemistry.

In the International Astronomical Union, Prof. Brown is President of the Commission 51 (Bioastronomy: Life in Space). He is also a member of the International Halley Watch. He has been a member of UNESCO's Australian National Advisory Committee's specialist committee for Natural Sciences. His current research interests cover theoretical chemistry, spectroscopy, galactochemistry and life in space.

Dr D. F. Eaton (USA)

David F. Eaton is Research Manager, Materials Science, within DuPont Central Research and Development with responsibility for research programs in photoscience, organic and inorganic nonlinear optics and materials physics. He is also Coordinator for the Corporate Center for Imaging Applications, a cooperative research endeavour among DuPont's Electronics, Imaging Systems and Central Research Science and Engineering sectors.

His education was obtained at Wesleyan University (AB, 1968) and Caltech (PhD, Organic Chemistry, 1972). He has worked in several areas of photochemistry and photoimaging during his career with DuPont: dye sensitized photopolymerization, electron transfer photochemistry, aqueous photoinitiators, organometallic photochemistry, silver halide sensitization chemistry, semiconductor particle photoredox chemistry, materials for nonlinear optics as well as photochemistry and photophysics of guest-host inclusion compounds.

He is the author of 80 research publications and reviews and has been granted four US patents. He is a Fellow of the Society for Imaging Science and Technology (IS&T), and a member of the American Chemical Society (ACS), American Association for the Advancement of Science (AAAS) and InterAmerican Photochemical Society (IAPS). He is currently President (1992–94) of IAPS, Chairman of the IUPAC Photochemistry Commission and a member of the US National Committee for IUPAC; he was Chairman of the 1991 Organic Photochemistry Gordon Conference.

Prof. N. N. Greenwood (UK)

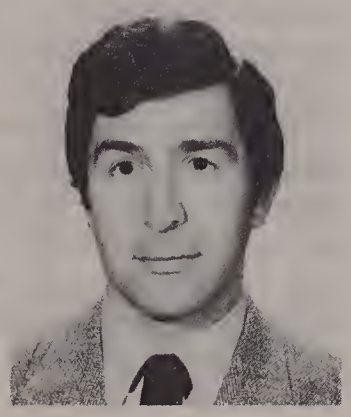
Norman Greenwood was born in Melbourne, Australia in 1925 and studied at the University of Melbourne (MSc 1948, DSc 1966) and at Cambridge University (PhD 1951, ScD 1961). He was awarded the D de l'Univ honoris causa of the University of Nancy, France in 1977 and was elected a Fellow of the Royal Society in 1987. He has been particularly active in both teaching and research and is well known for his work on national and international committees. He retired in 1990 as Professor of Inorganic and Structural Chemistry in the University of Leeds and is now Emeritus Professor of Chemistry. He was Dean of the Faculty of Science at Leeds (1986–88) and has held visiting professorships in Australia, Canada, Denmark, Japan, The People's Republic of China and the USA.

Prof. Greenwood has made numerous contributions to solid state chemistry and his book on *Ionic Crystals, Lattice Defects and Nonstoichiometry* (1968) had considerable impact, being translated into German, Japanese and Spanish. He was one of the first to apply the Mossbauer effect to the study of chemical problems and coauthored a definitive monograph on the subject in 1971. More recently he has made major contributions to the reaction chemistry and

structures of the boron hydrides and has opened up the new field of polyhedral metallaborane cluster chemistry. In all he has published some 450 research papers and 10 books, the most recent of which, *Chemistry of the Elements*, broke new ground and has already been translated into several other languages. Prof. Greenwood has received many national and international honours and awards and was last year elected Associe Etranger de l'Academie des Sciences, Institut de France. He has been President of the Dalton Division of the Royal Society of Chemistry and President of the British Association for the Advancement of Science, Section B (Chemistry).

Norman Greenwood has been active in IUPAC affairs for many years, particularly as Chairman of the Commission on Atomic Weights (1969–75) and President of the Inorganic Chemistry Division (1977–81). More recently he was (with Prof. Yves Jeannin) one of the two IUPAC members of the joint IUPAP–IUPAC Working Group on Criteria for the Discovery of the Transfermium Elements. He is strongly committed to the present moves to modernize and develop IUPAC structures so as to make the Union more effective in dealing with emerging needs in the coming years.

Prof. Yüksel İnel (Turkey)



Prof. Yüksel İnel was born in Istanbul, Turkey, on 8 February 1937. He is married with one son.

Education: Lic. Dipl. (BS) in Chemistry and Physics, Faculty of Sciences, University of Istanbul (1962); PhD in Chemistry, Edward Davies Chemical Laboratory, University College of Wales, Aberystwyth, UK (1968).

Positions: Research Chemist, Turkish Atomic Energy Commission, Nuclear Research and Training Center, Küçükçekmece, Istanbul, Turkey (1964–65); Research Assistant, University College of Wales, Aberystwyth, Wales, UK (1965–68); Post Doctoral Research Fellow, Department of Chemistry, University of Houston, Houston, USA (1968–70); Post Doctoral Research Fellow; Department of Chemistry, University of Calgary, Calgary, Canada (1970–71); Chairman, Department of Chemistry, Boğaziçi University, Istanbul, Turkey (1973–75), (1976–78), (since 1982); UNESCO, Man and Biosphere (MAB) Turkish National Committee Member, Ankara, Turkey (1974–81); Associate Professor (Docent) in Physical Chemistry, Chemistry Department, Boğaziçi University, Istanbul, Turkey (1975–81); Dean, Faculty of Arts and Sciences, Boğaziçi University, Istanbul, Turkey (1975–76); Director, The School for Advanced Vocational Studies, Boğaziçi University, Istanbul, Turkey (1976–79); Executive Committee Member, Environmental Sciences Research Group, The Scientific and Technical Research Council of Turkey, Turkey (1977–81); Visiting Research Associate, Department of Chemistry and The Hydrocarbon Research Institute, University of Southern California, Los Angeles, California, USA (1979–80); Professor in Chemistry, Chemistry Department, Boğaziçi University, Istanbul, Turkey (since 1981); Associate Professional Specialist, Radiation Laboratory, University of Notre Dame, Notre Dame, Indiana, USA (1981–82); Director, Institute of Environmental Sciences, Bogazici University, Istanbul, Turkey (1983–91). Member of the FECS (Federation of European Chemical Societies) Council (1989–90).

Certificates: Fortran IV Computer Programming, Houston Medical Center, Houston, Texas, USA (1969–70).

Awards (Fellowships): Research Assistantship, University of Wales, UK; Post Doctoral Research Fellowship, University of Houston, USA; Post doctoral Research Fellowship, University of Calgary, Canada.

Memberships: Royal Chemical Society, American Chemical Society, International Union of Pure and applied Chemistry, Turkish Chemical Society, Turkish Physical Society.

IUPAC Activities: Member of the IUPAC Committee on Teaching and Chemistry (since 1987); Member of Turkish National Committee for IUPAC and official delegate to General Assembly in Boston, USA (1987); Elected General Secretary of 35th IUPAC Congress, Istanbul (1975).

Current Research Interest: Gas kinetics and free radical chemistry, photolysis in the vacuum-UV region, environmental exposure analysis and the fate of chemicals in the environment, environmental photochemistry, heterogeneous photodegradation and photocatalysis, photocatalysis over clay support.

Publications: About 85 original research papers, reports, and review articles in English and in Turkish.

Prof. J. W. Lorimer (Canada)

Prof. J. W. (Jack) Lorimer was born on 16 April 1929 at Oshawa, Canada, and is married with two children. He graduated with a BA in 1951, MA in 1952 and PhD in 1954, all from the University of Toronto.

Positions held: Post-doctoral Fellow, Leiden University (The Netherlands) (1954–56); Assistant, Associate Research Officer, National Research Council of Canada, Atlantic Regional Laboratory, Halifax (1956–61); Special Lecturer, Dept of Physics, Dalhousie University (1960–61); Assistant Professor (1961–65), Associate Professor (1965–79), Full Professor (1979 to present), The University of Western Ontario, London, Canada; Visiting Professor at University of Southampton (1970–71), Glasgow University (1983-84); Visiting Fellow, Jagiellonian University, Cracow, Poland (1979), Murdoch University, Western Australia (1983); Member, Centre for Interdisciplinary Studies in Chemical Physics, The University of Western Ontario (1988 to present); Member, Scientific Advisory Board, Electrochemical Science and Technology Centre, University of Ottawa, 1990–93.

Fellowships: Chemical Institute of Canada.

Memberships: Chemical Institute of Canada; The Electrochemical Society.

IUPAC Activities: Commission on Solubility Data (V.8): Titular Member and Co-secretary (1979–83) (one of the

founding Titular Members of the Commission); Associate Member (1983–87); Titular Member, (1987–91), Chairman (1987–91); Organizer, Annual Meeting of Commission, London, Canada (1984). Editor-in-Chief, IUPAC Solubility Data Series (1988–present). As Chairman and Editor-in-Chief, he has been involved in renegotiation of the Commission's publication contract in 1987–88 and 1992–93.

Co-opted Member, Analytical Chemistry Division Executive, 1985–87 and 1991–93; Member of Canadian delegation to General Assembly, 1981, 1991, 1993. Chairman and Local Organizer, 1st IUPAC International Symposium on Solubility Phenomena, London, Canada, 1984.

Fields of Research: Applications of non-equilibrium thermodynamics of transport to electrolytes and membranes, and to electrochemical impedance spectroscopy. Experimental electrochemistry combined with methods in surface science to investigate alkaline batteries, solid-state lithium batteries, kinetics of corrosion of mineral sulphides and electroless deposition of precious metals on mineral sulphides. Luminescent porous silicon, its electrochemical properties and structure. Electrochemical preparation of insertion compounds, especially those with electrochromic properties. New techniques in the numerical evaluation of solubility data, which have been incorporated into the methodologies used in the IUPAC Solubility Data Project.

Publications: 40 papers in international journals, several review articles, and contributions to a number of volumes in the IUPAC Solubility Data Series.

Prof. E. Maréchal (France)

Prof. Ernest Maréchal was born on 28th March 1931. He is married with two children. He was a student at Ecole Normale Supérieure (Cachan); Agrégé de Sciences Physiques, Docteur es Sciences (Paris 1965); Full Professor at P. and M. Curie University (Paris VI); Director of the Laboratory of Macromolecular Chemistry (CNRS associated Laboratory) which employs about 80 scientists

His teaching subjects are: macromolecular chemistry (polycondensation, chemical modification, degradation); and general chemistry applied to the restoration and conservation in fine arts.

From 1965 to 1976 his research was mainly on cationic polymerization (reactivity; new monomers, etc). Since 1970 he has been increasingly interested in polycondensation and chemical modification of polymers; (kinetics, mechanisms); synthesis of new materials; liquid crystal polymers; thermostable materials. He has also studied enzyme catalysis in macromolecular chemistry. In 1976 he received the CNRS Silver Medal.

He has published about 230 articles, including reviews, in international journals and was the co-author of the book *Carbocationic Polymerization* (Wiley, 1982). He has also contributed to other books. He has been a member of the editorial boards of *Polymer Bulletin*, *Journal of Macromolecular Science – Chemistry*, *Journal of Polymer Science*, and *Polymer Journal*.

Maréchal was President of the 17th Section of the CNRS (molecular and macromolecular physical chemistry, 1983–87); Member of the CNRS Chemistry Department Council (1983–87); President of the scientific board of two CNRS laboratories; and Director of the CNRS Group of Coordinated Research on Composite Materials (1985–89).

Since 1987 he has been a Member of the Division Committee of the IUPAC Macromolecular Division. He became an Associated Member of the Commission on Macromolecular Nomenclature in 1991.

Prof. Leiv Kristen Sydnes (Norway)

Prof. Leiv Kristen Sydnes was born on 9 July 1948.

Education: BSc, University of Oslo, December 1971; MSc, Organic Chemistry, University of Oslo, October 1974; DPhil, Organic Chemistry, University of Oslo, November 1978.

Employment: Research Associate, University Oslo, 1974–78; Postdoctoral Fellow, University of Western Ontario, Canada, 1978–80; Associate Professor, University of Tromso, 1980–86; Visiting Professor, Iowa State University, USA, 1985–86; Professor, University of Tromso, since 1987.

Research: Organic chemistry; Photochemistry; Organometallic chemistry. Prof. Sydnes has had his own research group since August 1981 when the laboratories for organic chemistry were completed at the University of Tromso. Over the years he has received considerable financial support from several Norwegian research agencies, Norwegian chemical industry, National Research Council of Canada, NATO Scientific Affairs Division, and Sasakawa Foundation (1990).

Publications: His research has so far resulted in 70 scientific papers in international journals with a referee system. He has also written several contributions to *Houben-Weyl*. In addition, he has communicated research results orally and through posters at seminars, meetings, and conferences in Norway and abroad.

Professional activities: In addition to teaching, research and administration at the above mentioned universities, Sydnes has been involved in various other activities. Since 1980 he has been an external examiner at universities in Norway and abroad. He has been a member of the organizing committees of five Norwegian and Nordic meetings. Since 1989 he has been a member of the editorial board of *Acta Chemical Scandinavica* for which he has been a referee since 1984.

Within the Norwegian Chemical Society (NKS) he has been: Chairman of NKS Committee on Teaching 1975–77; Corresponding Member of the IUPAC Committee on Teaching of Chemistry (1975–77); Co-Editor of *Kjemi*, the NKS Journal, 1976; Member of the Editorial Board of *Kjemi* since 1989; Chairman of the Northern Norway Section of NKS, 1981–83; Member of the Board for NKS since 1983; Chairman of the NKS Committee on Media Relations since 1988; Vice-President of NKS 1988–91; President of NKS since 1992.

Industrial activities: He was Chairman of the Board for Unilab Analyse A/S, Tromso, 1989–90 and has been a member of the Boards of Unilab Analyse A/S, Tromso since 1990, Tromso Research Park, since 1991, and Marine DNA A/S, Tromso, since 1992.

Prof. C. Zhang (Chinese Chemical Society, Beijing)

Prof. Cunhao Zhang was born in Tianjin, China on 23 February 1928. He obtained his BSc from Central University , Nanjing in 1947, and MSc from the University of Michigan, USA, in 1950. He returned to China in November 1950 and has been with the Dalian Institute of Chemical Physics, Chinese Academy of Sciences since 1951, where he was an Assistant Professor from 1951-53, Associate Professor from 1953–62 and Professor of Chemistry from 1962. He was Deputy Director of the Institute during 1978–83 and Director from 1986–90. He was elected a Member of the Chinese Academy of Sciences (CAS), a title of the highest academic prestige in China, in 1981, and became a Standing Member of the Chemistry Division of CAS by election in 1983. He became President of the National Natural Science Foundation of China in 1991.

Prof. Cunhao Zhang's research activities began in the early fifties with heterogeneous catalysis. For 5 years, his group investigated the fluidized bed hydrogenation of carbon monoxide. This resulted in the development of a highly successful nitrided and alkalized fused iron catalyst.

His major research accomplishments have also included valuable contributions to combustion and short wavelength chemical lasers, and to the chemistry of excited molecules, in particular for the development of double resonance multiphoton ionization spectroscopy in probing short-lived and/or high-lying rovibronic states and in the study of quantum-state specific energy transfer dynamics of excited molecular species.

Prof. Cunhao Zhang has been an invited speaker at various universities and research institutions throughout the world including Germany, Japan, Republic of Korea and USA. He has also presented lectures at various international conferences, notably the San Francisco IQEC in 1986.

He holds part-time professorships at universities in several Chinese cities including Peking, Nanjing and Fudan and is on the editorial advisory boards of several journals including *JCS, Faraday Transactions*, *Spectrochimica Acta* and *Chem. Phys. Letters*. Prof. Cunhao Zhang is an Associate Editor of *Science* (China), *Chinese J. Chem. Physics* and *J. Molecular Science* (China) and a Standing Council Member of the Chinese Chemical Society. He is also a member of the Optical Society of America and an Associate Member of the IUPAC Commission on Molecular Structure and Spectroscopy. He was elected Vice President of the China Association of Science and Technology in 1991.

IUPAC Accounts for 1992

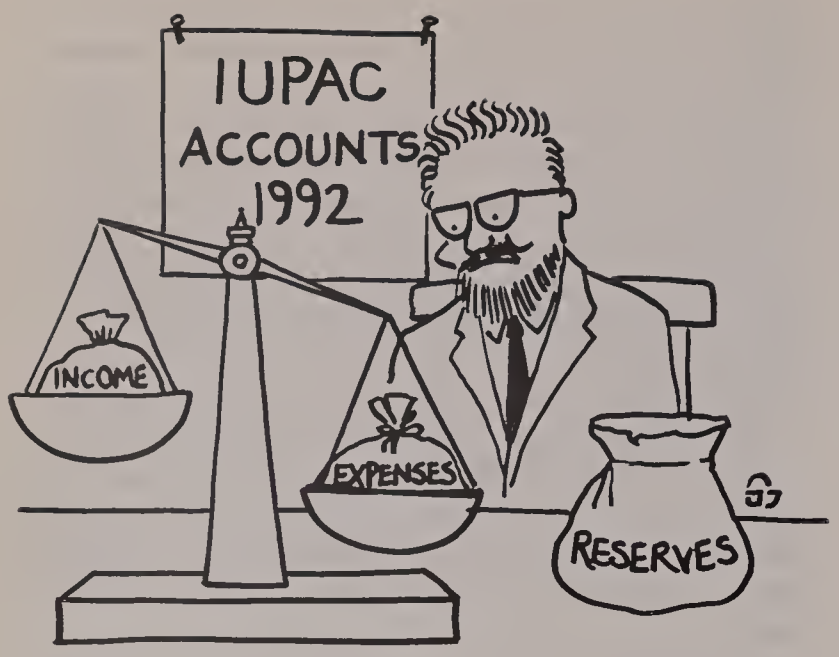
The audited IUPAC accounts and auditor's report for 1992 are preceded by the comments of the IUPAC Treasurer Prof. John Ward and the auditors' report.

Treasurer's comments

The 1992 accounts are cast in a form different from that of previous years. They now conform to international standards and are in a sequence and form which should make them easier to read. In particular, the new Summary of Income and Expenses immediately below the Balance Sheet shows separately and immediately the bottom lines of the three components which follow: General Income and Expenses, Publications Income and Expenses, and Affiliate Membership Programme Income and Expenses.

First reading of that summary showing an overall deficit of USD 72 390 leads to the conclusion that Council's 1991 ruling that the budget for 1992 should be balanced has not been met and not by a substantial margin. In fact, this is not so. Unfortunately, when the 1992 and 1993 budgets were cast, two items of expenditure were forgotten: depreciation of our fixed assets and provision of *CI* for Members. At the same time two items of income, grants from ICSU and con-

In spite of the difficulties facing the Finance Committee, the members managed to raise a smile when they met in Zürich on 22 February 1993. From left: (standing) Dr L. C. Krogh, Prof. J. M. Ward, Dr J. Brunner; (sitting) Prof. W. Heitz, Prof. E. J. Grzywa.



tribution from the Royal Society should have been omitted in conformity with the new accounts format. Together these mean that the 1992 budget was not balanced but was USD 54 913 in deficit and the 1993 budget which already has an inbuilt deficit of USD 52 000 actually carries a deficit of just over USD 100 000. So the true departure from the 1992 budget is USD 17 477 – only about 2% of turnover. The principal component of the USD 17 477 is a shortfall of USD 22 454 in interest and dividends from our invested reserves which is partly offset by a small net gain in the compounded over and under-spends of the other components. The shortfall in interest and dividends is principally the result of the lower returns from financial markets worldwide but is also the result of the interest and dividends from that part of our reserves set aside as a Building Fund accruing to that fund. Nevertheless, the Building Fund is part of our total reserves and the interest and dividends from it could be looked upon as providing most of the money needed to meet the USD 17 477 departure from the budget. It is good to note that in spite of the year being a difficult one for publication businesses, the surplus on the publications account has made up for the low return in 1991 and is at the level achieved in previous years.

Looking ahead to the next biennium 1994–95, in each year we shall be some USD 50 000 worse off than we had expected for the reasons which led to the errors in the 1992 and 1993 budgets. If national subscriptions were to remain at the 1993 level, to achieve a balanced budget in 1994 our total expenditure would need to be about USD 35 000 less than in 1992 and to balance in 1995 some USD 100 000 less than in 1993. Even if subscriptions were to increase by 5% in each of the years 1994 and 1995, expenditure in 1994 will need to be kept USD 10 000 below that in 1992, and for 1995, about USD 75 000 below that in 1993.

These restrictions can be met by cutting expenditure overall and reducing even further the money available for the Union's scientific work, but the more positive approach is to increase our income. The Union must be much more vigorous in doing this. Even in the years when we were making a surplus the Union was underfunded and only achieved its results by the sterling efforts of its Members in raising money from outside. Our attitude towards income can only be regarded as lax. Council has seemed to agree to increase subscriptions only with great reluctance, and has often turned down recommendations by the Bureau, Treasurer and Finance Committee. Even when subscriptions levels have been agreed, payment by the majority of countries is far too tardy. At the end of the first six months of 1992, only 22% of total subscriptions had been paid, after nine months 52% and at the end of November 63%. Such tardy paying would not be tolerated in most national scientific organizations which commonly bring in sanctions against non-payers at the end of three months. I strongly recommend that our regulations about late payment be tightened. It is not a case of obeying regulations imposed from above, but improving 'housekeeping' for the benefit of all parts of the Union and its scientific work. If subscriptions were paid on 1st January when they are due, we could gain income by earning interest on the money until it was required. As it is, we had to sell investments and thus lose interest, to provide the necessary money mid-year in 1992. It requires all sources of funding to be persuaded or bullied into paying promptly. Obviously, no organization wishes to pay up until it has to, for it too wishes to earn interest for as long as possible. Those responsible must badger to be paid and not sit back quietly and wait for the money to arrive.

Preparations are being made for an approach to the chemical industries in which the value of our work will be highlighted, a value many times the money they put into the Union. The timing of the approach is essential however, and must await the emergence of industry from the present universal recession.

Fortunately, our reserves remain strong, so we have funds to meet real emergencies. It must be pointed out again though, that it is very unwise to use reserves to rectify imbalances in revenue budgets. The system gets further and further out of equilibrium and when the reserves have been used up, the organization is in an irretrievable position.

Auditors' Report

As auditors of the International Union of Pure and Applied Chemistry we have examined the accounts for the year ended 31 December 1992 in accordance with the provisions of Swiss law.

We have come to the conclusion that:

- the balance sheet and statement of income and expenses are in agreement with the books;
- the books of account have been properly kept;
- the financial position and the result of operations are presented in accordance with the principles of evaluation prescribed by Swiss law and the requirements of the statutes.

As a result of our examination we recommend that the accounts submitted to you be approved.

NEUTRA TREUHAND AG
Zurich, 29 April 1993

IUPAC Accounts 1992 (expressed in USD)

Balance Sheet

Liabilities		Assets	
Capital Account	2 194 912	Fixed Assets[5]	43 522
Accounts Payable[1]	18 422	Cash in Banks[6]	334 655
Paulo Franzosini Fund	5 659	Marketable Securities at Cost	1 820 885
Provisions & Subaccounts[2]	310 201	Building Fund (held in GBP)[7]	319 291
Prepaid Subscriptions[3]	15 850	Accounts Receivable[8]	26 144
Sundry Creditors	17 050	Sundry Debtor	29 463
Capital Gains Realized[4]	198 742	Subscriptions, etc., Outstanding[9]	114 486
		Excess of Expenses over Income	72 390
	2 760 836		2 760 836

Summary of Income and Expenses

General Expenses net	211 368
Publications Income net	138 978
Affiliate Membership Programme	0
To Capital Account	72 390

General Income and Expenses

Income		Expenses	
National Subscriptions[10]	525 920	Office Expenses[15]	348 387
Company Associate Service Charges[11]	8 960	Expenses IUPAC Bodies[16]	253 888
Observer Country Service Charges[12]	750	Bad Debts Write Off[17]	4 550
Associated Organization Service Charges[13]	500	Bad Debts Provision	– 4 550
Interest & Dividends Earned	117 536	Other Expenses[18]	58 433
Other Income[14]	3 000	Foreign Exchange Differences	7 897
Debit to Capital Account	211 368	Depreciation	11 745
		Provisions: Committed Expenses	187 684
	868 034		868 034

Publications Income and Expenses

Income		Expenses	
Publications: Blackwell	307 990	Secretariat (Publications)	195 471
Publications: Pergamon	8 431	1990-2 *Chem. Intl.* to Symposia	1 261
Publications: Other Publishers	20 909	Pergamon Payments against Royalties	2 080
Publications: Secretariat	134	Miscellaneous Expenses[19]	19 674
BSP Support of Publication Activities	20 000	Credit to Capital Account	138 978
	357 464		357 464

Affiliate Membership Programme Income and Expenses

Income		Expenses	
Contributions[20]	75 900	IUPAC Secretariat	41 834
Royalties Blackwell	7 537	*Chem. Intl.* & Leaflets	46 358
Ties & Scarves	245	IUPAC Information	1 797
Transfer from General Income & Expenses	9 778	Miscellaneous Expenses	3 471
	93 460		93 460

Notes to accounts

1. *Accounts Payable*

List Oxford	17 277
List Zurich	1 145
	18 422

2. *Provisions and Subaccounts*

Committed Expenses	187 684
Bad Debts	48 993
CHEMRAWN Rolling Fund	15 358
Neutra Examination	6 200
Solubility Data Series	1 229
History of IUPAC	20 000
Purchases from Blackwells/ Pergamon	886
Royal Society Contbn. to Dev. Activs.	18 061
Kratos Grant	136
ICSU Grants	7 637
UNESCO Grants	1 013
Lewis Publishers	3 004
	310 201

3. *Prepaid Subscriptions*

Czechoslovakia NAO 1993	7 400
Hungary NAO 1993	4 200
Poland NAO 1993	3 400
IFCC AO 1993	50
China – 2 CAs 1993	800
	15 850

4. *Capital Gains Realized*

Capital Gains Realized	234 410
Foreign Exchange Differences	– 35 668
	198 742

5. *Fixed Assets*

Fixed Assets	65 003
Depreciation of Assets over 5 Years	– 21 481
	43 522

6. *Cash in Banks*

USD	286 391
GBP	1 187
CHF	6 076
DEM	38 627

East European Banks (revalued at 91.12.31 using relevant exchange rates for national currency to USD; no exchange rates available at 92.12.31)

Bulgaria	44
Czechoslovakia	517
Hungary	545
Poland	1 268
	334 655

7. *Building Fund*

On the recommendation of the IUPAC Council (Minute 7/91, 36th Meeting – Hamburg), part of the Union's assets have been moved into a building fund, to provide for the eventuality that the need for a permanent Secretariat building becomes pressing.

8. *Accounts Receivable*

List Oxford	26 144

9. *Subscriptions, etc.,. Outstanding*

National Organizations	114 101
Company Associates Service Charges	385
	114 486

National Organizations (1990)	
Ethiopia	400
Peru	2 100
Yugoslavia	3 550
	6 050

National Organizations (1991)	
Bulgaria	5 100
Chile	476
Ethiopia	400
Nigeria	2 400
Peru	2 000
Yugoslavia	4 500
	14 876

National Organizations (1992)	
Argentina	1 900
Belgium	13 000
Brazil	7 300
Bulgaria	2 200
Chile	1 600
Egypt	3 800
Ethiopia	400
Greece	2 400
Ireland	3 900
Italy	22 900
Japan	15 575
Korea	10 000
Malaysia	1 400
Nigeria	2 300
Yugoslavia	4 500
	93 175

Service Charges Company Associates (1991)	
USA	245

Service Charges Company Associates (1992)	
USA	140

10. *National Subscriptions*

Received	432 745
Outstanding	93 175
	525 920

11. *Company Associate Service Charges*

Received	8 820
Outstanding	140
	8 960

12. *Observer Country Service Charges*

Received	750

13. *Associated Organization Service Charges*

Received	500

14. *Pergamon Travel Grant*	3 000

15. *Office Expenses*

IUPAC Officers	4 669
IUPAC Secretariat (Non-pubns.)	292 881
Audit, Bank Fees, Other Charges	50 837
	348 387

16. *Expenses IUPAC Bodies*

Administration Expenses	17 416
Meetings other than General Assembly	236 472
	253 888

17. *Bad Debts Write Off*

Cuba (1989)	700
Cuba (1990)	1 900
Cuba (1991)	1 900
Jamaica (1990) – OC	50
	4 550

18. *Other Expenses*

Contributions to ICSU	13 747
Representatives of Other Organizations	11 557
Chem. Intl. for Members	11 168
Miscellaneous Expenses	185
Transfer to CHEMRAWN Account	12 000
Transfer to Affiliates in Developing Countries	9 778
	58 433

19. *Miscellaneous Expenses*

BSP Travel Grant	15 482
Other	4 192
	19 674

20. *AMP Contributions*

In USD	72 292
From East Europe	3 608
	75 900

Conferences

Advanced polymer materials
Dresden, Germany
6–9 September 1993

IUPAC SPONSORED

The International Conference on Advanced Polymer Materials is organized by the Institute of Polymer Research, Dresden, and the Institute of Macromolecular and Textile Chemistry of the Dresden University of Technology.

The conference will be a forum for scientists to discuss the latest achievements in the field of development of advanced polymer materials. Since it covers a wide range of topics, the conference will be held in 6 sections, each including invited and contributed papers and posters.

The following invited lectures will be presented:

1 *High-performance polymers*: LC polymers; Reinforced polymers.

- E. Martuscelli (Arco Felice, Italy): New advanced polymer materials by blending technologies.
- J. Economy (Urbana, USA): Factors controlling the microstructure of aromatic polymers.
- N. Ogata (Tokyo, Japan): Micro-composite systems by *in-situ* polymerizations.
- F. Karasz (Amherst, USA): Transitions in blends of side-chain liquid-crystalline polymers.

2 *Surface and interface phenomena*: In general (theory and methods); In blends and reinforced polymers.

- H. P. Schreiber (Montreal, Canada): Interfacial interactions and the polymer/polyurethane bond.
- A. Benninghoven (Münster, Germany): Surface analysis of polymer materials by secondary ion mass spectroscopy (SIMS).
- G. Beamson (Daresbury, UK): Recent advances in the high-resolution XPS of organic polymers.

3 *Reactive processing of polymers*: Reactive blending; Modification.

- M. Lambla (Strasbourg, France): Reactive extrusion: a new tool for the diversification of polymeric materials.
- D. Braun (Darmstadt, Germany): Influencing the morphology of polymer blends through graft copolymers.
- K. Takemoto (Osaka, Japan): High functional nucleid analogs.
- E. Borsig (Bratislava, Slovakia): Structure and properties of polystyrene – polyethylene IPN-like systems.
- A Gottschalk, (Ludwigshafen, Germany): Blends of polyphenylenether with styrene-copolymers.
- T. Inoue (Tokyo, Japan): Phase morphology and polymer-polymer interphases in polymer blends: light scattering and ellipsometry.
- J. L. White (Akron, USA): Reactive processing in a twin screw extruder.
- H. E. H. Meijer (Eindhoven, Netherlands): Distributive and dispersive mixing in highly viscous polymer melts – possibilities and limitations.
- E. Uhland (Essen, Germany): Prospectives in application of screw reactors in plastics processing.
- H. G. Fritz (Stuttgart, Germany): Highlights in reactive polymer compounding: On-line quality assessment, process control concepts and recent product developments.

4 *Characterization (New methods)*: In melt; In the solid state; In solution.

- S. Canadu (Strasbourg, France): Structural and dynamic properties of partially ionized polyelectrolyte gels.
- P. Kratochvil (Prague, Czechoslovakia): Advanced applications of classical light scattering from polymer solutions.
- Yu. Ya. Gotlib (St. Petersburg, Russia): The theoretical problems of the anisotropy of the local mobility in polymer chains in isotropic and ordered polymer systems and its manifestation in NMR and polarized luminescence.
- W. Burchardt (Freiburg, Germany): Title to be announced.

5 *Structure-property relationship*: Transformation; Physical ageing; Molecular modelling.

- M. Kryszewski (Lodz, Poland): Polymer blends: structure and specific interactions of components.
- W. J. MacKnight (Amherst, USA): Phase behaviour and structure in liquid crystalline polyurethanes.
- D. F. J. Balta Calleja (Madrid, Spain): Physical transitions and crystallization phenomena in polyethylene terephthalate studied by microhardness.
- F. H. Maurer (Gotenburg, Sweden): Physical ageing of heterogeneous polymers.
- H. Janeschitz-Kriegl (Linz, Austria): Fundamentals of texturing: Crystallization by heat transfer and flow.

6 *Cellulosics*: New solvents; Derivatization reactions; Special products.

- J. Schurz (Graz, Austria): Investigations on the structure of regenerated cellulose fibres.
- K. Kamide (Osaka, Japan): Recent advances in molecular characterization of cellulose and its derivatives.
- D. Fengel (Munich, Germany): Fascinated by a chain molecular – review of 30 years research on cellulose.

The conference language will be English. The registration fees are DEM 500 for active participants, DEM 450 for IUPAC affiliates, and DEM 250 for students. The fee includes admission to the sessions, receipt of printed materials, beverages in the breaks, and attendance at the welcome cocktail and the conference reception.

The conference will be held at the Three Magi Church Convention Centre right in the centre of Dresden. Dresden is one of the most beautiful towns in Germany with its rich cultural and scientific traditions. The baroque architecture, famous art galleries, and musical and theatrical events as well as marvellous surroundings attract millions of tourists. Business people and scientists are attracted by the town both for their traditions and its promising development as the capital of the re-established Free State of Saxony and 'gate to Eastern Europe'.

The weather at the beginning of September is mostly agreeable with average temperatures of 18°C and a few rain showers.

Accommodation has been reserved in different hotels of various categories. Early registration is recommended as hotel capacities are limited.

Dresden may be reached by rail, road or air. Rapid transportation from the airport to the town centre is available.

Chemistry of natural products Karachi, Pakistan 16–20 January 1994

IUPAC SPONSORED

The 19th International Symposium on the Chemistry of Natural Products will be held in Karachi, Pakistan, on 16–20 January 1994.

The aim of the meeting is to focus attention on key aspects of natural products chemistry, particularly with reference to stereoselective synthesis, novel spectroscopic techniques for structure elucidations, bioactive natural products and bioorganic materials. This will help to focus attention on current frontiers of organic chemistry, leading to the effective utilization of natural resources and demonstrate the vitality, diversity and economic importance of the subject.

The scientific programme will consist of special lectures, plenary lectures, session lectures and poster presentations. The invited lectures will be divided into the following four parallel sections:

- Synthesis of natural products
- Bioactive natural products
- Structural studies on natural products
- Bioorganic chemistry.

The following are some of the scientists who have agreed to present lectures: Sir D. H. R. Barton (USA); Prof. H. C. Brown (USA); Prof. R. R. Ernst (Switzerland); Prof. D. J. Faulkner (USA); Prof. R. Huber (Germany); Prof. Phillip Le Quesne (USA); Prof. Steven V. Ley (UK): Prof. K. Mori (Japan); Prof. R. Noyori (Japan); Prof. V. Volter (Germany); Prof. P. Vollhardt (USA); Prof. K. Hostettmann (Switzerland); Prof. M. H. Zenk (Germany). Lectures will be presented in English.

The registration fees will be USD 300 for scientific participants, USD 75 for students and USD 150 for accompanying persons. The fees includes admission to scientific sessions, receipt of printed materials (for participants and student registrants), attendance at the welcome reception and conference banquet.

Blocks of rooms have been reserved in different classes of hotels, close to the conference site. Karachi is a large and modern coastal cosmopolitan city with a population of about 10 million. It is considered to be the gateway to the subcontinent. Karachi has an international airport served by most major airlines, with connections to several destinations within Pakistan and abroad.

The weather in Karachi is very pleasant in January, mostly sunny with day temperatures of about 20°C. Handicrafts, leather goods, carpets, garments and a variety of other commodities make karachi a very attractive and economical shopping place. For fun and recreation sandy beaches like Hawkes Bay, Sandspit, and Paradise Point offer convenient and easy-to-reach resorts and are among the few green-turtle nesting grounds in the world. They are ideal for bathing, surfing and scuba diving. A number of ancient and historical sites are at a driving distance from Karachi. They include archaeological sites from ancient history, the early Muslim era and Moghul period.

Nutrition

The 15th International Congress of Nutrition will take place in Adelaide, Australia, from 26 September to 1 October 1993. The scientific programme will feature state-of-the-art plenary lectures on current major issues in human and animal nutrition. The programme will consist of 48 symposia and 48 workshops

The themes and topics of the symposia include: nutrition and the environment; nutrition policies and programs; prevention of chronic disease by nutritional means; nutrition through the life cycle; nutrition and nutritional anthropology of aboriginal peoples; cell biology and molecular biology in nutrition; nutrition and performance; animal nutrition; food science; clinical nutrition.

For further information please contact: The Secretariat, 15th International Congress of Nutrition, CSIRO, Division of Human Nutrition, PO Box 10041, Gouger Street, Adelaide SA 5000, Australia.

Chiral reactions in heterogeneous catalysis

A European Symposium on Chiral Reactions in Heterogeneous Catalysis will be held in Brussels, Belgium, on 25–26 October 1993 on the occasion of the Centenary of the Institut Meurice. This meeting is devoted to every type of chiral reaction in heterogeneous catalysis, for example: enantioselectivity attained by surface modification, grafting or inclusion of catalytic complexes and by homogeneous formation of a chiral complex, followed by heterogeneous reaction and release of the chiral ligand.

For further information please contact: Prof. G. Jannes, Ceria/Institut Meurice, Avenue Emile Gryzon 1, B-1070, Brussels, Belgium. Tel.: +32 (2) 526 73 15. Fax: +32 (2) 526 73 01.

Non-food uses of cereals

An International Symposium on Non-Food Uses of Cereals will be held at Akadémia utca 1–3, Budapest, Hungary, on 28–30 October 1993. The symposium is being organized by the Hungarian Scientific Society for Food Industry and the Department of Biochemistry and Food Technology, and sponsored by the International Association for Cereal Science and Technology (ICC), Hungarian Grain Trading Co., and the Working Group on Food Chemistry of the Federation of European Chemical Societies.

The scientific programme of the symposium will cover the following topics:

- Cereals as renewable raw materials; chemical composition of cereal biomass.
- Economic aspects of non-food uses of cereals.
- Potential non-food uses of starch, cereal proteins and other constituents.
- Cereals and the fermentation industry; present trends and future possibilities.
- New aspects of growing and breeding of cereals of non-food uses.

The symposium languages will be English and Hungarian (with simultaneous translation into English).

For further information please write to: MÉTE Secretariat, Dr R. Lásztity, H-1361 Budapest, Pf. 5., Hungary.

Chemistry and biology of municipal water treatment

The International Symposium on Chemistry and Biology of Municipal Water Treatment: Current Status and Future Directions will be held at the Canada Centre for Inland Waters, Burlington, Ontario, Canada, on 24–29 October 1993.

This is a special-topic conference organized by the Hamilton Section of the Chemical Institute of Canada, and the Wastewater Technology Centre, Burlington, Ontario. It is designed to bring together researchers, chemists, chemical engineers, technologists, planners, managers, users, emergency response personnel and other interested parties to learn, present, share and exchange ideas and information about research and applications. The current status and future trends in the research, application and practices relevant to the drinking water industry will also be emphasized.

Specific themes are:

1. Source water quality
2. Analytical measurement technologies
3. Treatment technologies and finished water quality
4. Distribution systems and related technologies
5. Risk assessment
6. Management
7. Education and workshops
8. Programme for developing countries.

For further information please contact: CAB-MWT'93 Symposium Chairman, Dr B. K. Afghan, Analytical Chemistry Research, Research and Applications Branch, National Water Research Institute, Canada Centre for Inland Waters, PO Box 5050, Burlington, Ontario, Canada, L7R 4A6.

Material technology and applications

INNOMATA – the International Exhibition and Congress for Materials Technology and Applications – will be held in Leipzig, Germany, on 22–25 November 1993. The exhibition will offer exhibitors and visitors a forum for the exchange of information on the entire range of materials, materials processing and materials applications. A representative selection of companies from all materials sectors will exhibit their products.

INNOMATA 93 will also provide an opportunity for visitors to view and compare structural and functional materials made of metals, ceramics, polymers, special materials and their composites, materials for energy, information processing and sensor technology as well as devices, equipment and processes for manufacturing, binding, corrosion protection, testing and recycling.

Parallel to the exhibition the organizers, DECHEMA Deutsche Gesellschaft für Materialkunde e.V., will be staging an international congress which will cover topical scientific and technical development lines in all areas of materials technology and applications. The programme will include:

- modern chemical materials;
- new developments in sensor an electronics materials;
- high-performance structural materials;
- intelligent processing;
- smart materials.

Manufacturers and processors of materials will be able to report on their technical know-how and their new developments.

At the same time a closing symposium will be held on the research and development programme 'Corrosion and corrosion protection' (FeKKs), which has been supported by the German Ministry of Research and Technology since 1974. The symposium will provide a survey on the current state of corrosion research and its practical applications.

Further details, registration documents for exhibitors and the call for papers can be obtained from: DECHEMA e.V., PO Box 15 01 04, D-6000 Frankfurt 15. Germany. Tel.: +49 (69) 7564 380/230. Fax: +49 (69) 7564 298.

Water quality

The Congress on 'Metropolitan Areas and Rivers' will be held in Rome, Italy, on 5–8 December 1993. Sponsors include the International Association of Water Pollution, Research and Control (IAWPRC) which is one of IUPAC's Associated Organizations.

The general programme will be divided into two sessions: (1) Quality of rivers in metropolitan areas and (2) planning and management problems. The Congress will bring together hydraulic engineers, hygienists, hydrobiologists, and urban planners who have technical authority and institutional competence for the management of rivers which come within the jurisdiction of metropolitan areas.

For further information please contact: Organizing Secretariat, Metropolitan Areas and Rivers, Studio Ega srl, Viale Tiziano 19, 00196 Roma, Italy.

Water quality is the subject of two international meetings later this year

The Beijing Congress

The 34th IUPAC Congress will be held at the Beijing International Convention Center from Sunday 15th to Friday 20th August 1993. The Congress, which has the theme 'Chemistry for the 21st Century – The Central Science' will cover a wide range of fields in chemistry and will provide a critical survey of the current state of knowledge and future trends in eight fields of chemistry. Plenary and invited lectures totalling about 100, will be presented by prominent chemists invited from all over the world. Each section will consist of invited lectures, oral contributions and posters.

Social programs are planned for active and accompanying participants and a technical exhibition will be held in the Center at the time of the Congress.

The official language of the Congress will be English. No translation facilities will be available.

The scientific programme will be devoted to the following eight sections of chemistry:

1 Life science and organic chemistry
2 Chemistry for a better environment and analytical chemistry
3 Chemistry of advanced materials and inorganic chemistry
4 New polymer materials and macromolecular science
5 Petrochemistry, fossil fuels chemistry and catalysis
6 Physical chemistry
7 Chemical information and computers in chemistry
8 Popularization and education of modern chemistry.

The registration fees are USD 390 for Congress participants, USD 350 for IUPAC affiliates, USD 220 for students and USD 180 for accompanying persons. Payment of the registration fee entitles the participant to participation in all scientific sessions, Preprint Book, Final Program, a welcome reception, a banquet, coffee breaks and an evening cultural performance

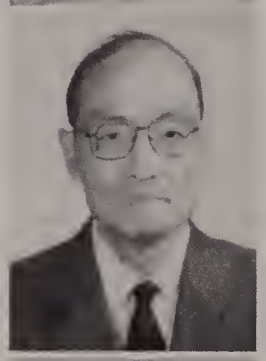
For hotel accommodation, participants will be accommodated either in the Continental Grand Hotel which adjoins Beijing International Convention Center or in the Grand Hotel Beijing which is a five-star hotel. Prices per night range from USD 50 to 150 for a single room and USD 100 to 320 for a double room. Accommodation for students in a student apartment is also available at USD 40.

All correspondence concerning the Congress should be addressed to: Prof. Xinqi SONG, Secretariat of 34th IUPAC Congress, c/o Chinese Chemical Society, PO Box 2709, Beijing 100080, China. Phone/Fax: +86 1 2568157.

Professor Xiaotian Liang — President of IUPAC Congress and Executive President of the Chinese Chemical Society

Professor Aoqing Tang — Chairman of the International Advisory Committee, IUPAC Congress and President of the Chinese Chemical Society

Professor Yadong Hu — Chairman of the Organizing Committee of the IUPAC Congress and President of the Chemical Society



Professor Kui Wang — Treassurer of IUPAC Congress and President of the Chinese Chemical Society

Professor Xingqi Song — Secretary-General of IUPAC Congress and Deputy Secretary-General of the Chinese Chemical Society

Professor Lianghe Shi — Deputy Secretary-General of the IUPAC Congress

Professor Qifeng Zhou — Deputy Secretary-General of the IUPAC Congress

Erratum

'The Beijing Congress: Chemistry for the 21st Century – The Central Science.' On page 71 of the March 1993 of *Chemistry International* the top three photographs were unfortunately transposed with the bottom four photographs. This was due to an error at the production editing stage of publication. As a result all the designations were incorrect. The correct designations are shown on the right. The Editor and Production Editor of the magazine offer their sincere apologies to the members of the Chinese Chemical Society and IUPAC Congress shown in the photographs and regret any embarrassment and confusion this may have caused.

Conference Calendar

Conference circulars and registrations forms for the IUPAC-sponsored conferences listed below may be obtained, upon request, from the names and addresses shown in italics.

1993

Macrocyclic chemistry

27 June – 2 July
18th International Symposium on Macrocyclic Chemistry.
Enschede, Netherlands.
Dr J. F. J. Engbersen, Department of Chemical Technology, University of Twente, PO. Box 217, 7500 AE Enschede, The Netherlands. Tel.: +31 (53) 892926. Fax: +31 (53) 356024.

Spectroscopy

29 June – 4 July
18th Colloquium Spectroscopicum Internationale.
York, UK.
XXVIII Colloquium Spectroscopicum Internationale, Department of Chemistry (CSI Secretariat), Loughborough University of Technology, Loughborough, Leicestershire, LE11 3TU.

Cationic polymerization

5–8 July
11th International Symposium on Cationic Polymerization and Related Ionic Processes.
Borovets, Bulgaria.
Dr I. V. Berlinova, Institute of Polymers, Bulgarian Academy of Sciences, 1113 Sofia, Bulgaria. Tel.: +359 (2) 700138/7133663. Fax: +359 (2) 707523. Telex: 22729 echban bg.

Boron chemistry

11–15 July
8th International Meeting on Boron Chemistry (IMEBORON VIII), Tennessee, USA.
Mr Glenn Trantham, Secretary, IMEBORON VIII, UTK Conference Center, PO Box 2468, University of Tennessee, Knoxville, TN 37901, USA.

Optics and dynamics of polymers

12–15 July
33rd Microsymposium on Macromolecules, Optics and Dynamics of Polymers.
Prague, Czech Republic.
33rd Microsymposium, P.M.M. Secretariat, c/o Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences of the Czech Republic, 162 06 Prague, Czech Republic. Tel.: +42 (2) 360317. Fax: +42 (2) 367981. Telex: 122019 IMCP C. E-mail: KOUS@CSPGFU11.BITNET

Fluorinated monomers and polymers

19–22 July
34th Microsymposium on Macromolecules, Fluorinated Monomers and Polymers.
Prague, Czech Republic.
34th Microsymposium, P.M.M. Secretariat, c/o Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences of the Czech Republic, 162 06 Prague, Czech Republic. Tel.: +42 (2) 360317. Fax: +42 (2) 367981. Telex: 122019 IMCP C. E-mail: KOUS@CSPGFU11.BITNET

Harmonization of internal quality assurance schemes

26–29 July
5th International Symposium on the Harmonization of Internal Quality Assurance Schemes for Analytical Laboratories.
Washington, DC, USA.
Dr Michael Parkany, ISO Central Secretariat, Case postale 56, CH-1211 Genève 20, Switzerland.

Heterocyclic chemistry

1–6 August
14th International Congress on Heterocyclic Chemistry.
Antwerp, Belgium.
Prof. F. C. Alderweireldt, Antwerp University, Groenenborgeriaan 171, B-2020 Antwerp, Belgium.

IUPAC General Assembly

5–12 August
37th IUPAC General Assembly.
Lisbon, Portugal.
The IUPAC General Assembly is not open for general participation but restricted to members of IUPAC bodies that meet on this occasion.

Visas

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Mössbauer effect

8–14 August
International Conference on the Applications of the Mössbauer Effect. Vancouver, Canada.
Prof. J. G. Stevens, Mössbauer Effect Data Center, University of North Carolina at Asheville, One University Heights, Asheville, NC 28804, USA.

IUPAC Congress

15–20 August
34th IUPAC Congress.
Beijing, China.
Prof. Xinqi Song, Secretary General of 34th IUPAC Congress, c/o Chinese Chemical Society, PO Box 2709, Beijing 100080, China. Tel.: +86 (1) 2568157 or 2564020. Telex: 20035 CAST CN c/o CAST.

Organosilicon chemistry

15–20 August
10th International Symposium on Organosilicon Chemistry.
Poznan, Poland.
Xth International Symposium on Organosilicon Chemistry, Prof. B. Marciniec, Chairman of the Organizing Committee, Faculty of Chemistry, Adam Mickiewicz University, Grunwaldzka 6, 60-780 Poznan, Poland.

Solution chemistry

15–21 August
23rd International Conference on Solution Chemistry.
Leicester, UK.
Dr M. J. Blandamer, Department of Chemistry, Leicester University, University Road, Leicester, LE1 7RH, UK.

Plasma chemistry

22–27 August
11th International Symposium on Plasma Chemistry.
Loughborough, Leicestershire, UK.
ISPC 11, Loughborough University, Loughborough, Leicestershire, LE11 3TU, UK. Tel.: +44 (509) 224172. Fax: +44 (509) 222854.

Macromolecule–metal complexes

30 August – 3 September
5th International Symposium on Macromolecule-Metal Complexes.
Bremen, Germany.
Prof. D. Wöhrle, Institute of Organic & Macromolecular Chemistry, University of Bremen, Leobener Str. NW 11, W-2800 Bremen 33, Germany.

Euroanalysis VIII

5–11 September
Euroanalysis VIII — European Conference on Analytical Chemistry.
Edinburgh, UK.
Miss P. E. Hutchinson, Analytical Division, Royal Society of Chemistry, Burlington House, Piccadilly, London W1V OBN, UK. Tel.: +44 (71) 437 8656. Fax: +44 (71) 734 1227. Telex: 268001.

Advanced polymer materials

6–10 September
International Conference on Advanced Polymer Materials.
Dresden, Germany.
Technische Universität Dresden, Dezernat 5, Zentrales Tagungsbüro, Mommsenstraße 13, Dresden, O-8027, Germany.

Vienna will host the 8th High Temperature Materials

Organometallic chemistry

19–23 September
7th International Symposium on Organometallic Chemistry Directed Toward Organic Synthesis (OMCOS-7).
Kobe, Japan.
Prof. Shun-Ichi Murahashi, Department of Chemistry, Faculty of Engineering Science, Osaka University, Machikaneyama, Toyonaka, Osaka 560, Japan.

1994

Natural products chemistry

16–20 January
19th International Symposium on Natural Products Chemistry.
Karachi, Pakistan.
Prof. Atta-ur-Rahman, Chairman, Organizing Committee, H.E.J. Research Institute of Chemistry, University of Karachi, Karachi-75270, Pakistan. Tel.: +92 (21) 470007 or 476131. Fax: +92 (21) 467887 or 466896. Telex: 28095 HEJRI PK. E-Mail: atta%hejfirst@unet.uu.net.

High-temperature materials chemistry

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Vienna, Austria.

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Prof. K. L. Komarek, Institut für Anorganische Chemie der Universität Wien, Währingerstraße 42, A-1090 Wien, Austria. Tel.: +43 (222) 345 424, Fax: +43 (222) 310 4597.

Pesticide chemistry

4–9 July
8th International Congress of Pesticide Chemistry.
Washington, DC, USA.
Dr J. R. Plimmer, ABC Laboratories, 7200 ABC Lane, PO Box 1097, Columbia, MO 65205, USA.

Macromolecules

11–15 July
35th International Symposium on Macromolecules.
Ohio, USA.
Macroakron'94, Cathy Manus-Gray, Symposium Coordinator, Institute of Polymer Science, The University of Akron, Akron, OH 44325-3909, USA.

Carbohydrates

17–22 July
17th International Carbohydrate Symposium. Ottawa, Canada.
Dr H. Jennings, Institute of Biological Sciences, National Research Council of Canada, 100 Sussex Drive, Ottawa, Ontario, Canada, K1A OR6.

Excitonic processes in condensed matters

19–22 July
International Conference on Excitonic Processes in Condensed Matters.
Darwin, Australia.
Dr J. Singh, Faculty of Science, Northern Territory University, PO Box 40146, Casuarina, NT 0811, Australia.

Coordination chemistry

24–29 July
30th International Conference on Coordination Chemistry.
Kyoto, Japan.
Prof. H. Ohtaki, Laboratories of Coordination Chemistry, Institute for Molecular Science, Myodaiji-cho, Okazaki 444, Japan.

Polymer networks 94

25–29 July
35th Microsymposium on Macromolecules.
Prague, Czech Republic.
Dr B. Valter, Institute of Macromolecular Chemistry, Academy of Sciences of the Czech Republic, Heyrovského Nám. 2, 162 06 Prague, 6-Petriny, Czech Republic.

Physical organic chemistry

September
12th International Conference on Physical Organic Chemistry.
Padova, Italy.
Prof. G. Scorrano, Dipartimento di Chimica Organica, Università degli Studi di Padova, Via Marzolo 1, 35100 Padova, Italy. Fax: +39 (49) 831222.

Liquid crystal polymers

6–9 September 1994. International Conference on Liquid Crystal Polymers. Beijing, China.
Prof. Xibai Qiu, Chinese Chemical Society, PO Box 2709, Beijing 100080, China.

Organic synthesis

December
10th International Conference on Organic Synthesis.
Bangalore, India.
Prof. G. S. R. Subba Rao, Department of Organic Chemistry, Indian Institute of Science, Bangalore 560 012, India.

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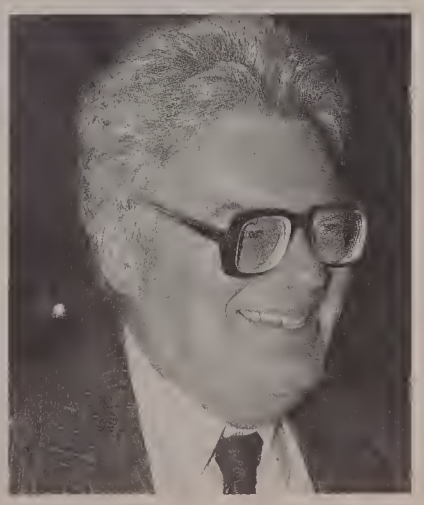
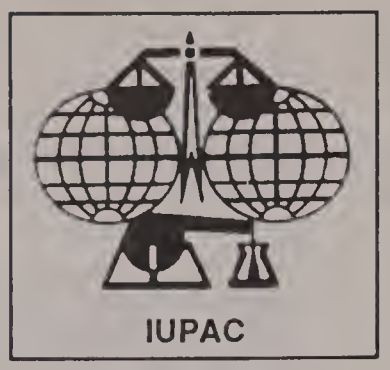
Zamaraev nominated as President



At its meeting in Newark, NJ, USA, in April, the IUPAC Executive Committee unanimously agreed to propose Prof. Kirill Zamaraev (Russia) as a candidate to fill the vacancy of President of the Union on 1 January 1994. The vacancy has arisen because Vice-President and President-Elect Prof. H. A. Staab (FRG) is unable to become President due to unforeseen circumstances (*see* p. 147).

Zamaraev, who is Director of the Boreskov Institute of Catalysis (Russian Academy of Sciences, Siberian Branch) in Novosibirsk, has an extensive experience of the Union. He was President of the Physical Chemistry Division (1987–89) and is currently a Member of the Bureau (1989–93), a Member of the Executive Committee (1991–93), a Member of the Publications Committee (1990–93) and is Chairman of the Editorial Advisory Board for 'Monographs on Chemistry for the 21st Century' (1990–93) – a series he initiated.



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Chemistry International

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(*Front cover photo and photos in 'Chemistry in UNESCO' article courtesy of UNESCO.*)

International Union of Pure and Applied Chemistry

Solid state chemistry in the basic academic curriculum

The Inorganic Chemistry Division's Commission on High Temperature and Solid State Chemistry is concerned about the low emphasis on the solid state in most basic academic curricula, despite the rapidly increasing importance of materials chemistry in the technological evolution. A task force has been set up to promote the introduction of more solid state chemistry in undergraduate teaching. This is a report of that task force, prepared by Drs J. Edwards and L. Kihlborg in collaboration with Drs J. Corish and G. Rosenblatt.

Historical perspective

Materials have been of paramount importance for the progress of mankind. Predominant materials employed by ancient peoples have been used by archaeologists to label whole ages in the development of mankind, for example, the stone age and the bronze age. Originally, materials for protection against the elements, for hunting, for weapons, for tools, and for other practical purposes were whatever nature could provide: wood, hides, bone, wool, clay, stone, which one learnt to shape and process to suit one's needs. The harnessing of fire opened the route for chemistry to play an active role in materials development, albeit by accidental discovery and trial and error. Pottery and bricks with much improved properties and, somewhat later, glass came to be used. Although native copper and gold had been found occasionally, the discovery of ways of chemically processing ores made other metals available; alloys, refining, casting, and tempering became widespread if still small-scale by modern standards. The continuous development of metallurgical techniques has had an enormous impact on man's development and led to the availability today of an extremely rich variety of metallic materials, with useful and modifiable properties covering a very wide spectrum.

Prescientific developments in other areas vital to the advance of mankind followed similar lines. Especially important were paper, fabrics, and construction materials.

The range of man-made materials other than metals and alloys started to widen in the last century with the birth of Portland cement. It was soon followed by the synthesis of the first artificial polymeric materials, celluloid and bakelite, about one hundred years ago, as a result of the rapid development of organic chemistry. In the last few decades we have witnessed a tremendous expansion and diversification of the field of synthetic plastics. These have to a certain extent replaced metals and other traditional materials in many applications and also found completely new uses.

Emergence of materials chemistry

Materials science, to anticipate a modern concept, was for a long time equivalent to ceramics and metallurgy, and even fairly recently, advances essentially followed the ancient pattern of learning by trial and error without real understanding, while being driven at a much faster pace by the incentives and imperatives of the industrial revolution. Inorganic materials remained predominantly the traditional ones until far into this century. Metals were gradually improved and tailored for different applications by alloying

In the past few decades we have witnessed a tremendous expansion and diversification of the field of synthetic plastics. (*FAO photo by F. Mattioli.*)

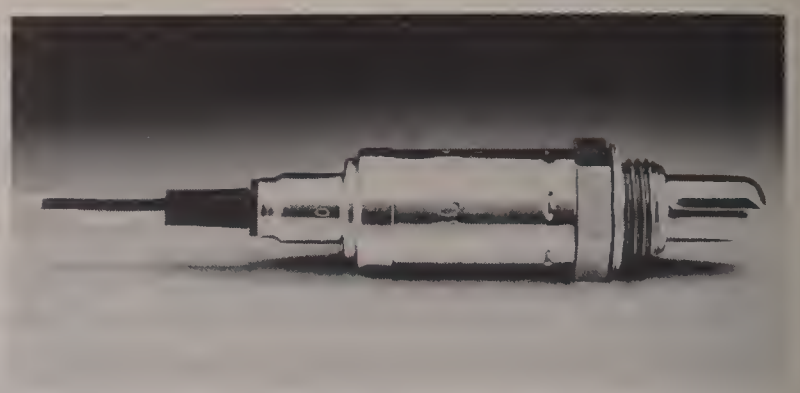
and various heat treatments but the materials "revolution" started when scientists began to get a fair understanding of the fundamental chemistry and physics of the solid state. Especially the discovery of X-ray diffraction made it possible to fathom the structure of crystals and to begin to appreciate the relation between structure and properties. This opened the way to active development of materials with desired properties developed on the basis of rational basic concepts. Such development is, however, a tremendously complex task; not only are there more than 90 chemical elements having a wide range of properties with which to experiment, but the properties of interest form a wide spectrum within which each application requires that a specific combination be considered. Although we have come some distance along the road we are very far from the goal; general prediction of properties from first principles and tailoring of materials at the writing desk or computer terminal with high accuracy.

Materials science has become a truly multidisciplinary field in which the chemist's role tends to increase with increasing complexity of the materials used. This evolution has very clearly been demonstrated in the recent intense pursuit of high-temperature superconductors, where 7- or 8-component systems are often explored, and needs for correct syntheses among intricate phase relations put high demands on understanding of basic chemistry.

At practically every moment people today are confronted with products of materials technology. The phosphors on TV screens and in fluorescent lamps are based on subtle chemical modification of various host materials. The ferromagnetic γ-iron oxide on magnetic tapes and discs has been prepared and optimized by a many-step chemical redox process. Optical fibres, which have become crucial in communication and data transmission, are made by careful control of desired substitutions and removal of interfering impurities. The heart of the exhaust control in our car engines, which is designed to minimize damage to our environment, is a chemical solid-state cell acting as an oxygen sensor (the lambda sond) and the catalytic converter itself is a triumph of solid-state chemistry. Piezoelectric materials, in which the bonding pattern makes the crystal electrically polar, are used as sound detectors and generators and as pressure sensors in electronic balances and many other applications. Nitride ceramics may replace metals in gas turbines to allow for higher working temperature and conserve energy. By proper synthesis conditions hydroxyapatite can be prepared to be an almost perfectly biocompatible implant for bone substitution. These are just a few random examples; the applications of various types of plastics and other polymers are innumerable.

Solid state chemistry for all

How do we educate our students in solid-state chemistry to meet the demands of their future professional environment? It is clear that some knowledge of the peculiarities of the solid state are relevant in view of the importance of materials in our society. Equally important is to appreciate that fundamental concepts such as stoichiometry, reactivity and bonding have to be modified and extended from their usual introductory-chemistry level to describe the behaviour of solids. Should chemists educated to university level go through their professional lives with unquestioning faith in simple-ratio stoichiometry, when so much modern technology is based on the defect chemistry of semiconductor materials? Should not every chemist be given a fair knowledge of nonstoichiometry and solid solutions? Should they not be made aware of the importance of defects and diffusion for the reactivity of solids and be introduced to ideas such as band structure, sintering, glass transition, magnetic ordering, ferroelectricity, solid electrolytes, luminescence, and laser action, to name a few important concepts? With a basic knowledge of the solid state they should be much more aware of the great role chemistry plays today and be better prepared to work in all the rapidly growing interdisciplinary areas of science where materials are involved.



The lambda sond, an essential component in the emission control system of modern cars, is based on a solid state electrochemical cell. (*PHOTO: Robert Bosch GmbH.*)

Here we are not talking of optional courses in solid state chemistry. Such specialized courses are widely offered in the curriculum and may even give room for a treatment of the subject at some depth. They are probably chosen by only a small minority of the students, however. We are rather discussing the insight that all chemistry students should carry with them through life; and we submit that solid state chemistry should be included in the basic, compulsory curriculum. There it might form a separate course, but the topics could also be incorporated into existing courses of general, physical, inorganic, and organic chemistry.

There are some didactic problems associated with the introduction of solid state chemistry in the basic curriculum. Since we are here dealing with highly polyatomic systems, the simplifying rules that apply to small molecules often fail. New concepts such as electronic bands must be introduced, but this can be done qualitatively rather easily by extension of the concept of molecular orbitals. Emphasis is, moreover, put on a number of physical properties, and this requires a fair knowledge of basic physics. This is a problem faced already in physical chemistry and should not be a major obstacle. Basic physics has become a necessary prerequisite for all fields of chemistry, and if a student does not have the necessary training in physics from secondary school a basic course must be taught to the chemistry students anyhow. This course should then include the elementary concepts necessary for an appreciation of a basic solid state chemistry course.

What should be taught?

What should be the content of a basic course in solid state chemistry? Naturally, it depends on how much time can be devoted to this topic. It is our belief that to be meaningful and to give the minimum acceptable understanding of the new concepts introduced, a course should not be less than two weeks of *full-time* study, corresponding to 20–25 lecture hours and additional laboratory sessions. A small questionnaire made within the task force and sent to a few additional solid state scientists in different countries has given the following indication of the possible content of a course of this length.

Chemical bonding in solids	10%	(8–20%)
Crystal chemistry	22%	(10–40%)
Amorphous matter	4%	(0–6%)
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Phase equilibria	11%	(5–25%)
Defects in solids; defect equilibria	11%	(4–30%)
Thermal properties	3%	(0–5%)
Reactivity of solids	12%	(5–24%)
Electrical transport properties	10%	(5–20%)
Dielectric properties	3%	(0–8%)
Magnetic properties	5%	(0–12%)
Optical properties	4%	(0–6%)

This list is not a recommended course content; it is only meant to show various topics considered relevant in a short solid state chemistry course. There is obviously overlap with other chemistry and physics courses that are usually included in the curriculum. Whether the topics are all taught in a separate course, included as a whole in the inorganic or physical chemistry courses, or are divided between different courses that the students have to take may be an important didactic problem but is otherwise irrelevant. However, it is not quite fair to simply cut away some topics just because they can be considered as physics. This is a truly interdisciplinary field of science, and students must be given a feeling for the importance of the interplay between physics and chemistry. Besides that, it is generally the application of materials, based primarily on their physical properties, that makes students interested and motivated for this study, particularly since there are so many applications they meet in daily life.

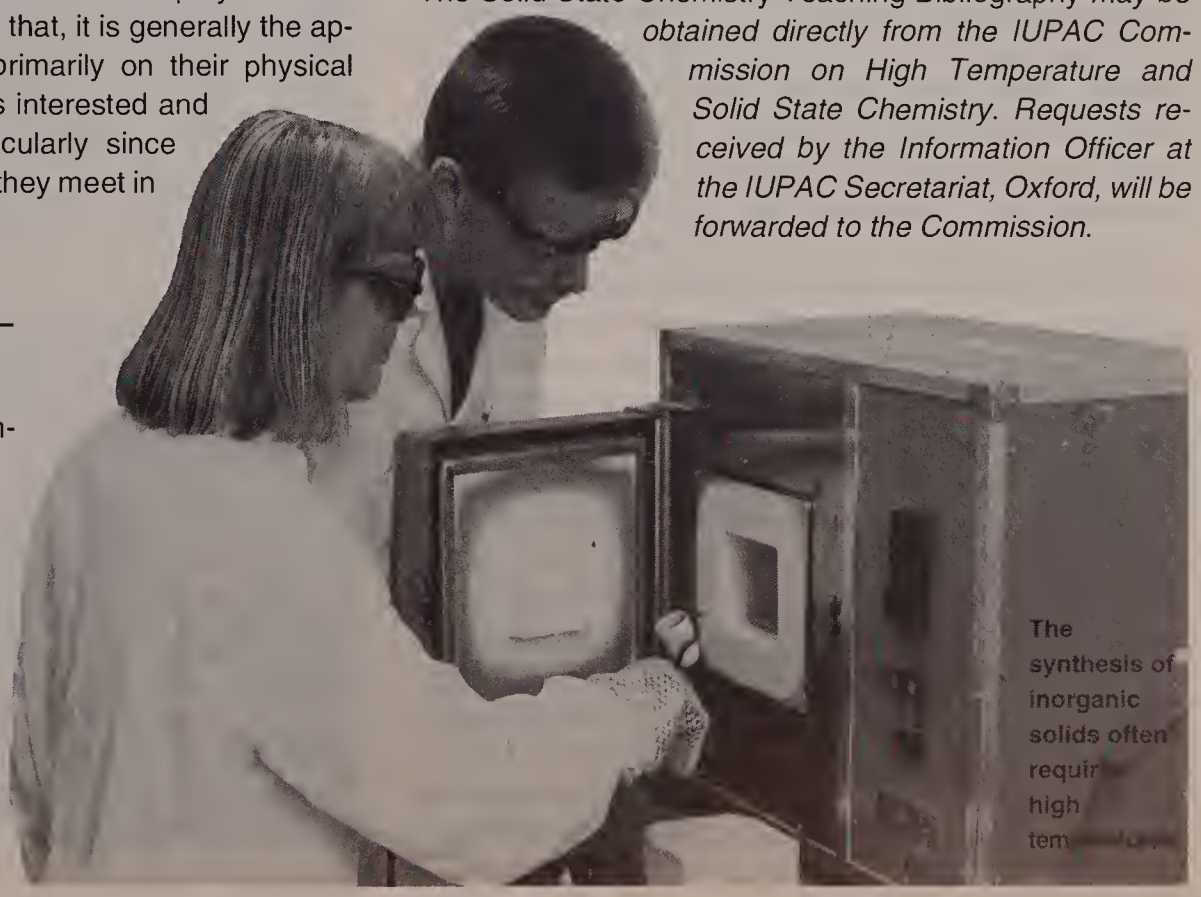
Laboratory experiments – a problem

Like courses in all fields of chemistry – except perhaps theoretical chemistry – a course in solid state chemistry should include laboratory experiments. Here lie considerable problems which may explain why this area has not been taught to a larger extent. On the synthetic side, reactions involving solids very often require high temperatures to proceed at a reasonable speed. Thus good furnaces are needed and the techniques of handling powered reactants – thorough mixing and pressing tablets – are not insignificant. Pertinent identification and analysis of the products are difficult to do in a meaningful way without access to X-ray diffraction equipment. For demonstration of materials properties, equipment that is normally not found in a teaching laboratory is also needed and some introduction of associated theory – of X-ray diffraction, for example – may have to be included. At some universities one can to some extent resort to research facilities and expertise, while at other places the necessary investment in equipment and training of assistants inevitably constitutes a barrier that has to be overcome. An effort is being made within the Commission to collect instructions for suitable laboratory experiments which are reasonably simple and require a minimum of expensive equipment. These instructions will be made available in due course. All suggestions and contributions are welcome!

Bibliography

While there exist rather comprehensive textbooks (in English) on solid state chemistry, there is a shortage of texts that cover the field at the level of a short basic course. At least one short text has appeared on the market recently, however, and some modern texts on inorganic chemistry have included much more material on the solid state than has previously been the norm. As a help to teachers who want to include solid state chemistry in the curriculum, we have prepared a list of textbooks and pertinent references to literature in the field. It is our hope that this bibliography, although certainly subjective and incomplete, will be useful for those teachers who have no recent training or research experience in solid state chemistry. We will try to update it continuously and it will be available free of charge through the Commission.

The Solid State Chemistry Teaching Bibliography *may be obtained directly from the IUPAC Commission on High Temperature and Solid State Chemistry. Requests received by the Information Officer at the IUPAC Secretariat, Oxford, will be forwarded to the Commission.*



The synthesis of inorganic solids often requir high tem

Chemistry in UNESCO

Many of UNESCO's chemistry programmes operate within regional and international networks of collaborating institutions and individuals. Chemistry is also a significant component of many of UNESCO's other programmes on education, science and the environment.

UNESCO Director-General Federico Mayor.

Introduction

The United Nations Educational, Scientific and Cultural Organization was set up in 1945. At its founding, UNESCO almost became UNECO. Meeting in wartime London, UK, to consider a successor to the League of Nations' International Institute of Intellectual Co-operation, the Conference of Allied Ministers of Education had proposed UNECO. The 'S' was added only in November 1945 by the preparatory commission that met in London to create UNESCO. The change was made in response to pressure from scientists' groups, particularly in the UK. They included UNESCO's first Director-General, Julian Huxley who insisted that science should be included as 'the chief means for raising the level of human welfare'.

UNESCO is an intergovernmental organization within the United Nations system with over 170 Member States. Its programmes therefore respond to the priorities of these states. The current Director-General is Federico Mayor. The UNESCO Secretariat, located in Paris, France, has five programme sectors: Education; Natural Sciences; Social and Human Sciences; Culture; and Communication, Information and Informatics.

The Natural Sciences Sector consists of the Office of the Assistant Director-General (Adnan Badran) and the following division or offices:

Science and Technology Programmes

- Basic Sciences Division
- Engineering and Technology Division

Environment Programmes

- Bureau for Co-ordination of Environment Programmes
- Division of Earth Sciences
- Division of Ecological Sciences
- Division of Water Sciences
- Office of the Intergovernmental Oceanographic Commission (IOC) and Marine Science-related Issues.

IOC is an intergovernmental commission that enjoys functional autonomy within the UNESCO structure. It even has its own Member States.

The following intergovernmental scientific programmes are also run by the UNESCO Secretariat: the International Hydrological Programme (IHP); the Man and the Biosphere Programme (MAB); and the International Geological Correlation Programme (IGCP).

UNESCO also has a number of field offices organized on the following regional basis: Africa; Arab States; Asia and the Pacific; Europe and North America; and Latin America and the Caribbean. Regional Offices for Science and Technology are located in Nairobi, Kenya (Africa); Cairo, Egypt (Arab States); New Delhi, India (South and Central Asia); Jakarta, Indonesia (South East Asia and the Pacific); Venice, Italy (Europe) and Montevideo, Uruguay (Latin America and the Caribbean). In addition, there are smaller offices in Beijing (China) and Brasilia (Brasil).

Chemistry programmes of UNESCO's Science Sector and Education Sector over the period from the 1970s to 1984 were described in the article 'Chemistry in UNESCO' published in *Chem. Intl.*, No. 4, 2–11, 1984. The present article is an update of that article.

View of Paris from UNESCO Secretariat.

Networks

Within the Division of Basic Sciences, there are 17 operating networks involving the major part of the Division's programmes. These networks embrace not only chemistry but also mathematics, physics, biology, microbiology and biotechnology. Each network provides for its own advanced training programme and supports collaborative research projects normally in association with suitable adjunct networks, which are in many cases directly funded by a Member State.

UNESCO defines a network as an agreement between research groups and institutions for continuing collaboration, with the main objectives of interaction and communication among participants in order to learn from one another. The network system is a cost-effective activity as it makes full use of existing facilities; it is flexible in that it responds quickly to local requirements through its coordinating board; and it deals mostly with decentralized operations.

Funding is provided from both UNESCO's Regular Programme and Participation Programme, and through extrabudgetary funding provided by Member States. Support is given to the following scientific activities:

- training courses and workshops;
- scientific meetings;
- research support programmes;
- grants;
- collaborative research programmes.

Chemistry networks in Asia include the Network for the Chemistry of Biologically Active Natural Products and an interdisciplinary programme called Botany 2000 – Asia.

Vladimir Zharov, Director, Division of Basic Sciences (left) and Adnan Badran, Assistant Director-General of UNESCO.

Chemistry networks and their cooperation

Chemistry networks in Asia are coordinated through the Asian Coordinating Group for Chemistry (ACGC). This is a planning group that is open to all agencies and organizations that have active programmes in chemistry in the region. The group helps develop grass-roots programmes in Member States and is capable of using the network system to deliver necessary services where they are needed, and to coordinate various activities so that there is no duplication.

Each network in the ACGC group provides for its own training programme in advanced techniques, and supports collaborative research projects normally in association with suitable adjunct networks. The operational networks in Asia are:

- Asian Network for Analytical and Inorganic Chemistry.
- Network for Instrument Maintenance, Development and Repair (NIDMAR). The UNESCO/IUPAC Programme for the Production of Low-Cost Locally Produced Equipment is associated with NIDMAR.
- Regional Network for the Chemistry of Natural Products in South-east Asia.
- Network for the Chemistry of Biologically Active Natural Products.
- Botany 2000 – Asia. This is an interdisciplinary programme on the botany (taxonomy), pharmacology and chemistry of tropical plants.

ACGC and associated networks are truly cooperative, with support provided not only by an annual allocation from UNESCO but also by the Governments of Australia, Japan, New Zealand and Thailand with additional support-in-kind provided by the Institute of Chemistry of Malaysia and many universities in Asia.

ACGC serves a research population of about 3600 scientists working in their own institutions and provides research and travel grants to about 50 scientists each year. The group is an example of UNESCO facilitating cooperation of active scientists on the ground. The multiplying factors are research papers, operational research equipment, access to publishing in refereed journals and equipment for teaching laboratories.

Presently, ACGC provides analytical services to around 2000 scientists each year from a variety of service centres and voluntary units in Asia. The service centres supported by UNESCO are at Silpakorn University in Thailand and the University of Tasmania in Australia, with additional services provided by Sydney University and the University of Western Australia. Presently the services available are:

- Single crystal X-ray crystallographic analysis.
- Mass spectrometry.
- Nuclear magnetic resonance spectroscopy up to 500 MHz, although the bulk of the requests are in the range 60–100 MHz.
- High-resolution ultraviolet and infrared spectroscopy.
- Micro-analytic services.
- An embryonic literature service is already under way and will be considerably strengthened in the near future.
- Biological screening facilities will be available after a series of training courses to develop technical methods most appropriate to local requirements as well as providing valid bioassays.

January 1991 saw the publication of the first issue of *ACGC Chemical Research Communications*. This biannual publication, edited by Mohinder Singh (Malaysia), provides a channel of communication for scientists in Asia to disseminate their research results. All communications are refereed by an international panel of scientific advisers. Young Asian scientists are particularly encouraged to use this publication for the communication of their research results.

UNESCO supports the local production of laboratory equipment.

Analytical and inorganic chemistry

The Asian Network for Analytical and Inorganic Chemistry (ANAIC) was created as a joint initiative of the Federation of Asian Chemical Societies (FACS) and UNESCO in 1985, to encourage Asia-wide cooperation in the standardization of analytical techniques, to address the problems of instrument maintenance and to encourage research in frontier areas of inorganic chemistry. Shortly afterwards, the Network for Instrument Development, Maintenance and Repair was established through funding by the International Development Programme of Australia, and was associated with ANAIC. All members of FACS are *inter-alia* members of ANAIC, as are members of NIDMAR.

ANAIC operates in the following areas:

1 Bio-inorganic chemistry;
2 Environmental chemistry;
3 Analytical standardization;
4 Food chemistry;
5 Instrument maintenance and repair;
6 Analytical techniques and selected topics in modern inorganic chemistry.

The network's operations are overseen by a board drawn into various groupings and are in general separately managed. Thus there is a group for each area mentioned above.

ANAIC organizes workshops and training courses, provides travel grants and small research grants, and promotes international conferences. The 1st ANAIC International Conference on the Chemistry and Technology of Silicon and Tin was held in Malaysia in 1989. The second in the series, on materials science, is planned for 1993 or 1994. ANAIC also supports the FACS Asian Chemical Conferences, held every two years. Under the programme of environmental chemistry, the first activity was held in September 1989 in Brisbane, Australia, namely the Regional Symposium on Chemistry and the Environment.

The Australian funded NIDMAR is responsible for all ANAIC activities dealing with instrument installation, maintenance and repair of sophisticated equipment, such as mass and NMR spectrometers.

ANAIC is also involved in promoting local production of laboratory equipment, which is carried out in conjunction with the UNESCO/IUPAC programme for low-cost locally produced equipment. The objective of this programme is to develop laboratory equipment for chemistry teaching at university level, to promote curriculum development and to encourage local teachers to produce experiments suitable for their own students. Workshops on low-cost laboratory equipment for chemistry are organized regularly, and travel grants to attend these activities are provided. The topics of the workshops are the assembly of equipment, for example the trifunctional pH-mV-conductometer, together with training of the use and maintenance of the equipment.

In addition, within this programme, support is also given for:

1 Development of low-cost laboratory equipment;
2 Creation of training manuals for locally produced;
3 Creation of pilot projects in Asia for low-cost locally produced equipment;
4 Curriculum development;
5 Technician training;
6 Computers as teaching aids.

Chemistry of biologically important natural products

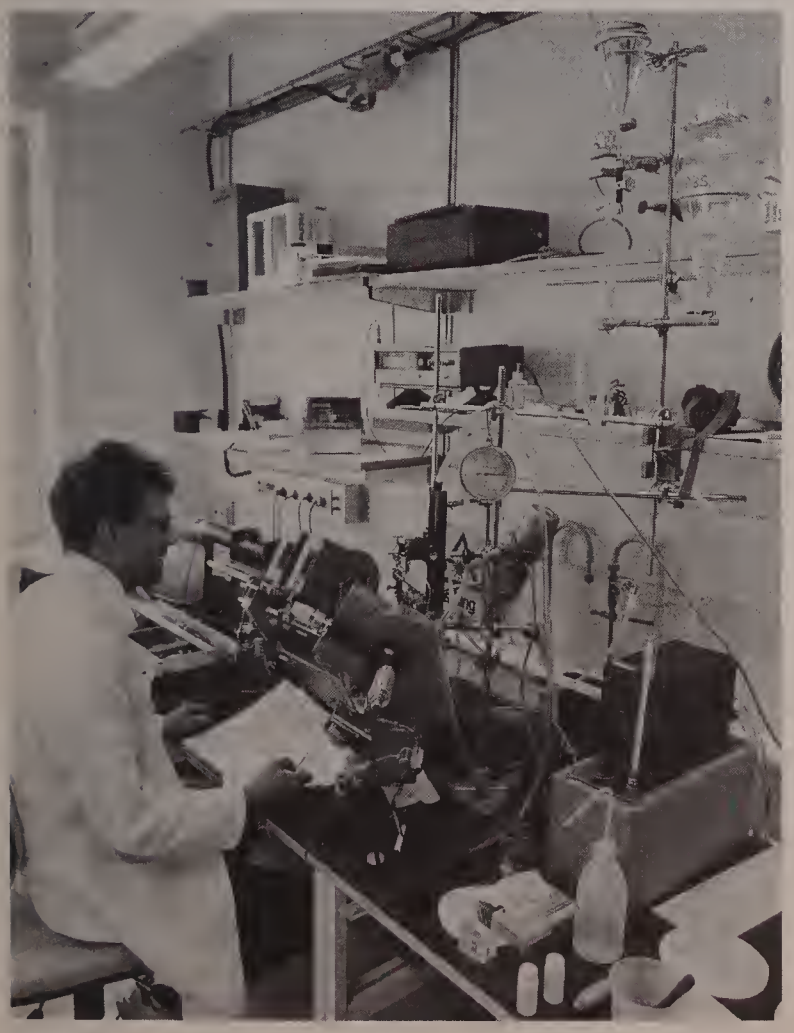
In 1975, UNESCO established the Regional Network for the Chemistry of Natural Products in South-east Asia. This consists of a regional group of 10 countries, each providing a National Point of Contact (NPC). The countries are: Australia, Hong Kong, Indonesia, Japan, Republic of Korea, Malaysia, New Zealand, Philippines, Singapore and Thailand.

The network is governed by a Coordinating Board consisting of all 10 NPCs and representatives of UNESCO. It receives financial support from the regular budget of UNESCO and from the Government of Japan through a funds-in-trust agreement with UNESCO.

The main objective of the network is to promote the chemistry of natural products in South-east Asia, with the main characteristics consisting of self-help, flexibility and development through personal cooperation.

The Coordinating Board for the network meet once a year, and a *Newsletter of the Regional Network for the Chemistry of Biologically Important Natural Products* is published three times a year.

The Network for the Chemistry of Biologically Important Natural Products (NCBINP) was established in Perth 1982 by the Australian Government, and the management was transferred to the International Development Programme (IDP) of Australian Universities and Colleges in 1983. Since that time the network has been operated as part of IDP's Core Programme of activities funded by the Australian Government.



Networks are active in collaborative research programmes and the provision of consultant and research support services.

The network was initiated after a request for support to the existing UNESCO funded Network for Chemistry of Natural Products in South-east Asia as an adjunct of this network in the South Pacific. Today, it covers 8 countries: China, Fiji, Indonesia, Malaysia, Papua New Guinea, Philippines, Thailand, and Vietnam. However, the primary concern of the network is to encourage research in institutions in Indonesia, Malaysia, the Philippines and Thailand. The network's major activities are collaborative research programmes, provision of consultant services and research support services.

The Natural Products Research Network for Eastern and Central Africa (NAPRECA), based in Addis Ababa, Ethiopia, was founded in 1984 and received affiliate status with UNESCO at the UNESCO General Conference in November 1987. The network is supported by UNESCO and various national and international organizations.

The network is based on a grouping of six countries of the Eastern and Central African subregion: Ethiopia, Kenya, Rwanda, Sudan, Tanzania and Zimbabwe. A coordinating board drawn from these countries governs the network. The board decided at its meeting in Nairobi, Kenya, in January 1991 that NAPRECA should focus on two groups of activities: (i) the chemistry of natural products, and (ii) the Botany 2000 programme.

The main objective of the network is to develop and promote natural products research in the subregion through the implementation of various activity programmes.

In association with ACGC, NAPRECA decided, during a meeting in Xiamen, China, in February 1990, to establish a UNESCO Analytical Service Centre at Addis Ababa University to provide spectral analyses and other data to research groups free-of-charge.

The first of NAPRECA's Natural Products Summer Schools was held in Ethiopia in 1988.

Medicinal and aromatic plants

The South and Central Asian Medicinal and Aromatic Plants Network (SCAMAP), based in New Delhi, India, was established by UNESCO in January 1979 for the development of the chemistry of medicinal and aromatic plants of the region, and is entirely supported by the UNESCO Regional Office for Science and Technology in South and Central Asia (ROSTSCA).

The network is governed by a council which consists of NPCs from each of the 12 countries involved in the network: Afghanistan, Bangladesh, Bhutan, Burma, India, Iran, the Maldives, Mongolia, Nepal, Pakistan, Sri Lanka and Turkey. The NPCs are national representatives normally nominated by a university chemistry department.

The council meets from time to time at the site of a conference, seminar or workshop held in the region. A newsletter is published annually.

SCAMAP is closely associated with the new Botany 2000 programme. A special programme on high-altitude medicinal plants is to be inaugurated. This will include botany, chemistry and pharmacology. Special research support systems will also be provided for research workers in Burma, Nepal and Bangladesh, and training programmes on herbarium management will be introduced.

University science teaching

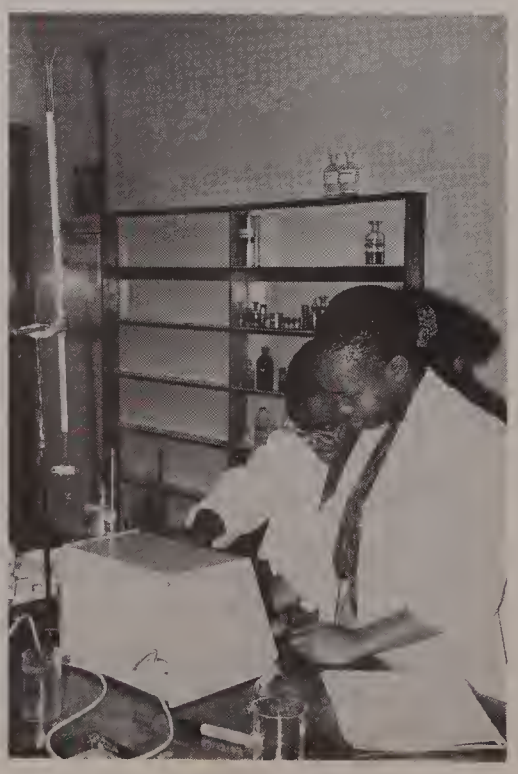
In 1975 UNESCO decide to begin developing programmes which would concentrate on the first-year level laboratory teaching of biology, chemistry and physics. This was a significant step. Since its creation in 1948, UNESCO has always worked to emphasise the importance of the teaching of science. This drive led, for example, to the establishment of the teaching commissions of the various international unions in the late 1950s – including IUPAC's Committee on Teaching of Chemistry (CTC).

Initially much of UNESCO's activities was related to institution building, with financing from the United Nations Development Programme (UNDP). During the decade 1960–70, UNESCO launched and financed a series of Regional Pilot Projects in each of the disciplines, such as chemistry in Asia. These pilot projects represented the first effort to galvanize the human resources in developing countries and were the first examples of both international cooperation (North–South) and regional cooperation (South–South).

Secondary-school curricula were chosen and the level was that at which each of the experimental sciences were taught as an independent subject, that is towards the end of the secondary cycle.

Experience derived from the UNDP–UNESCO projects particularly at university level indicated two main drawbacks in the teaching of science. The first was a slavish attachment to curricula developed in other countries, normally the university at which the local staff member studied. The second was the approach to laboratory teaching. While the projects did provide equipment, it became increasingly obvious that equipment would be a continual problem for teaching laboratories.

In 1975 UNESCO therefore decided to try, on an *ad-hoc* basis, to sensitize teachers in developing countries to the prospect of self-help in developing curricula that would reflect local needs. Scientists in the industrial world were also encouraged to recognize these needs and not to try to force their views on their colleagues in developing countries.



UNESCO has published a series of *Sourcebooks of Experiments* linked to local needs and resources.

Many problems were slowly identified, for example, the need to recognize the special needs of language groups other than English – to acknowledge that they especially would need help in text-book writing in their own language and also the need to mobilize locally and to make decisions locally reflecting local concerns. These problems and the need to encourage self-help led UNESCO to pioneer the concept of Networks of Cooperating Universities.

Responding to these needs UNESCO began, in a stepwise fashion, to mobilize each group of professionals. In 1976, it held its first workshop in chemistry in the Republic of Korea: university chemistry teachers did the actual experiments and then wrote them up in a manner in which they would wish to present them to their students. The teachers were able to pick and choose experiments from a broad selection. The result was the first UNESCO *Sourcebook of Experiments* in Korean and in English. The second was in Arabic, the third in Spanish followed by a series in French. No effort was made to translate the texts, since UNESCO wished to encourage local development of the experiments so that they fitted in which the local needs and resources.

Continual debate among the network members led to the next step: how to address the deplorable lack of equipment in Third World teaching laboratories. UNESCO joined first with IUPAC to launch the second phase, the local production of laboratory equipment (see *Chem. Intl.*, **8**, 8–12, 1986). Two approaches have so far been used. One is teacher-led; the other depends more heavily on technicians designing and making equipment on request.

The teacher-led approach was pioneered at the University of Delhi, India, as a joint activity by chemists and physicists. The idea was to develop prototypes, which were then built by teachers during a series of 30 workshops throughout the world. Over the years the design has improved dramatically and there is now a wide range of instruments available. Additionally, there are now many groups throughout the world, in France, Jordan and Thailand, to name a few, which are constantly updating the available designs.

What this programme has shown is that the problem of no teaching equipment can be overcome at the local level. The equipment programme also gives an opportunity to review laboratory curricula and gives an impetus to modernizing its content. This review of laboratory curricula is now part of two Pilot Projects in the Philippines and in Thailand.

Foundation courses in modern science

Within the framework of its University Science Teaching Programme, the Science Sector has launched a new international project to assist developing countries to improve the quality and effectiveness of introductory university courses in physics, chemistry and biology. The project is primarily concerned with both traditional and distance learning courses that provide the foundation for further studies in other fields of science and in engineering. It is motivated by the widely shared view that existing courses do not adequately cover key topics of modern, contemporary science and that insufficient emphasis is given to experiments and student laboratory work.

Microcomputer applications is one of the topics of a new university science teaching project launched by UNESCO to help developing countries.

The project is initially concentrating on introductory physics and chemistry courses. It builds on the accumulated expertise of already existing UNESCO activities in university physics and chemistry teaching such as:

- local production of laboratory equipment (referred to above);
- curriculum development programmes of the UNESCO networks;
- applications of microcomputers;
- video films and other teaching aids;
- advisory services to faculties of science of universities in developing countries;
- cooperation with regional and international non-governmental organizations such as IUPAC.

The project provides a new focus for international cooperation on university science teaching where university scientists from industrialized and developing countries can share experiences, expertise and ideas, and collaborate in the development of teaching materials.

The project has started with the elaboration of source materials for the courses including reading material, experiments for lecture demonstrations and the laboratory, audiovisual teaching aids, microcomputer applications, homework problems, and reference materials. This will be followed by the establishment of pilot projects for the courses at selected universities in developing countries. Once developed, tested and implemented at various universities, the courses will serve as useful models for other universities.

In March 1990, UNESCO convened an international working group to advise on the various aspects of the project. The working group considered the University Foundation Course project an ideal project for UNESCO to undertake for the following reasons:

1 The project falls squarely within the mandate of UNESCO ('S' and 'E' in UNESCO).

2 Introductory undergraduate courses in the basic sciences are also a key element in the university training of a vast range of professionals on whose skills a country depends for its development.

3 The syllabus of introductory courses and the approach used to teaching them has not changed significantly during the last 30 years. There is insufficient emphasis on contemporary science and experimentation.

4 A particularly attractive aspect of the project is that it will lead to concrete, highly visible outputs such as text and source books, model experiments and lecture demonstrations, video films, computer simulations and so on. These will be immediately useful to many universities in developing and industrialized countries.

5 The project will be able to draw on the experience and results of several ongoing major national projects.

6 The project will be completed in 6 years and give rise to specific pilot projects in developing countries with funding provided by bilateral and multilateral sources.

The working group agreed with UNESCO's proposals concerning the structure of the University Foundation Courses, that is, a core unit covering the first half of the course and separate, flexible modules on selected specific topics. With this, it becomes possible to parcel out pieces of the course to different working groups and individuals, with overall coordination provided by a steering committee. It was considered most important that universities in developing countries, which would eventually host pilot projects, would participate in the elaboration of the course from its start. Once the project is completed after 6 years, 10 universities in developing countries will have elaborated, in international cooperation, model courses in physics and chemistry.

International centres

The UNESCO International Centre for Chemical Education (INCE) at Ljubljana, Slovenia, has been developing a programme of international activities to meet the needs of university chemical education since 1976. It has mobilized 212 university and research institutions from 57 countries with the following activities:

- joint projects for the development of university teaching, especially in university–industry cooperation;
- research and development of informatics based methods and techniques in chemistry;
- organization of seminars and expert meetings in selected fields of chemistry and technologies based on chemistry;
- joint development of chemistry teaching equipment and materials;
- organization of material support in the form of literature, speciality chemicals, equipment and instrumental services for developing countries, which participate in the programme.

The centre has organized permanent expert groups, covering selected fields of chemistry and its applications in solving developmental problems.

The following fields are in the forefront of INCE's efforts for university–industry and agriculture cooperation:

- small-scale production of (speciality and pure) chemicals;
- chemical hazardous waste processing;
- chemical basis for biotechnological applications.

Travel grants are awarded for participation in training activities, international conferences and workshops on chemical education and university–industry cooperation.

Activities of the International Network of Chemical Education include the organization of material support in the form of literature, specialty chemicals, equipment and instrumental services for developing countries.

Support is also given to the following INCE activities:

1 Involvement of Chinese chemistry teachers in the Centre's activities;

2 Development of databases at the University of Ljubljana, Slovenia, for use in promoting service activities in INCE;

3 Interuniversity cooperation for development of databases on specific items;

4 Provision of laboratory equipment;

5 Technical missions for instrument repair.

The *Centre International Francophone pour l'Education en Chimie ((CIFEC)* was created, with the help of UNESCO, in 1984 following proposals put forward during the IUPAC-sponsored 9th International Conference on Chemical Education which was help in Montpellier, France, in 1983. This centre forms part of the International Network for Chemical Education (INCE).

The initial composition of the CIFEC Scientific Committee included Danièle Cros (Université des Sciences et Techniques du Languedoc) who is a member of the IUPAC Committee on Teaching of Chemistry (CTC) and Maurice Chastrette (Université Claude Bernard, Lyon) who was formerly Chairman of CTC. CIFEC has corresponding members in some 18 Francophone countries.

CIFEC was created specifically to meet the needs of Francophone countries in the development of chemical education. Its objectives include:

- dissemination in Francophone countries of the results of both French and international research in chemical education;
- informing the general public in Francophone countries of the importance of chemistry;
- technician training;
- preparation of French reference works for chemistry teachers;

UNESCO chairs and joint lectureship programmes

UNESCO chairs

UNESCO has initiated a new programme for the promotion of international intellectual cooperation involving the establishment of *International University Chairs*. The chairs will be created in the fields of education, science, culture and communication at higher education institutions in all regions of the world, initially in the developing countries.

The broad aim of the UNESCO Chairs Scheme is to foster the advancement of science and the transfer of knowledge by facilitating access worldwide to the expertise of outstanding specialists in important disciplines. Their more immediate and direct function is to assist developing countries in strengthening their capacities for high-level training and research as a means of bridging the gap separating them from the industrialized world in the areas of science and technology.

Full details of the UNESCO Chair Scheme may be obtained from: The Division of Higher Education and Research, UNESCO, 7, place de Fontenoy, 75700 Paris, France. Tel.: +33 (1) 45 68 10 00. Telex: 204461 Paris. Fax: +33 (1) 40 65 94 05.

Lectureship programme

The Joint Lectureship Programme was initiated in 1987 by the International Council of Scientific Unions (ICSU) and the Third World Academy of Sciences (TWAS). In 1989 it was joined by two new partners: UNESCO and the Commonwealth Science Council (CSC).

Under this programme, eminent scientists in all fields of science and technology from all parts of the world are invited to lecture and hold discussions with scientists in developing countries.

The objective of the programme is to provide scientists and scientific institutions in developing countries with the opportunity to establish and enhance collaboration with colleagues from other countries who have made significant contributions to the advancement of science.

A roster of lecturers has been compiled containing names of eminent scientists who have been put forward by members of ICSU, TWAS, UNESCO and the CSC. About 25 lectureship visits are sponsored each year.

All enquiries, including those for copies of the roster, the request form and addresses of endorsing organizations, as well as invitations for lecturers should be sent to: The Third World Academy of Sciences (TWAS), c/o International Centre for Theoretical Physics (ICTP), PO Box 586, 34136 Trieste, Italy. Tel.: +39 (40) 2240-1. Cable: CENTRATOM. Telex: 460392 ICTP I. Fax: +39 (40) 224559. E-Mail: twas@itsictp.bitnet.

- preparation of French teaching manuals in both theoretical and experimental chemistry;
- research in chemical education;
- cooperation with experts and other international centres of chemical education.

In order to achieve these objectives CIFEC has already organized a number of activities and projects including seminars and workshops on chemical education, for example: Tunis, Tunisia, September 1984; Rabat, Morocco, October 1985; Montepellier, France, June 1986; La Grande Motte, France, October 1990; Notsé, Togo, February 1986.

Correspondence relating to INCE should be addressed to: Prof. Aleksandra Kornhauser, Director, International Centre for Chemical Studies (ICCS), University of Edvard Kardelj, Ljubljana, Slovenia.

Postgraduate training courses

During 1988–89 over 20 postgraduate training courses were held within the Network for Long-term Postgraduate Training Courses. They included: International Training Course in Research Techniques in Chemistry (Australia, 1989); The 9th and 10th Postgraduate Training Courses in Macromolecular Chemistry (Czechoslovakia, 1988 and 1989); Postgraduate Training Course in Phytopharmaceutical Chemistry (France, 1989); Postgraduate Training Course in Inorganic Chemistry (Ireland 1989); International Programme in the Chemical Sciences (Sweden 1989).

Science and technology education

Since the 1970s, the Science and Technology Education Section of the Education Sector has been sponsoring participants, especially those from developing countries, to the attend the biennial IUPAC-sponsored International Conferences on Chemical Education (ICCE). The most recent of these conferences was held in Bangok, Thailand in December 1993.

In 1989 and 1992, respectively, the Section supported the workshop and symposium on energy and environment as related to chemistry teaching. In these, UNESCO worked in cooperation with the IUPAC Committee on Teaching of Chemistry (CTC) and the US Department of Education. The first meeting was hosted by the Lawrence Hall of Science, University of California at Berkeley, USA.

The Section has produced a series of publications entitled *New Trends in Chemistry Teaching*. The sixth title in this series was published in 1992. Another title published by the Section was *Teaching School Chemistry*. This was edited by one-time CTC Chairman David Waddington. The Section has also contributed financially to the publication *Education and Training in Chemistry in Europe* (1991) edited by A. D. Ashmore, E. K. McEwan and M. J. Withers. Finally, the Section supports the production of the ICSU–CTS *International Newsletter on Chemical Education* which is published by CTC and edited by IUPAC affiliate Peter Towse. The latest issue (December 1992) focused on 'Chemistry and the Environment' (see *Chem. Intl.* **15**, 136, 1993).

UNESCO has developed networks of researchers from different disciplines, countries and sectors of society to tackle environmental problems.

Environment programmes

UNESCO has been working to address environment and development problems for more than 40 years. UNESCO's mandate, which spans the fields of education, science, culture and communication – has enabled it to promote and 'pilot-test' integrated approaches to understanding and eventually solving these problems.

UNESCO's role in tackling environmental problems includes building networks of researchers from different disciplines, countries and sectors of society. It also helps to develop and maintain long-term inventory and monitoring networks such as the Biosphere Reserve Network and the Global Ocean Observing System. Other UNESCO activities relating to the environment include training researchers and managers and the production of education materials for science programmes at the primary and secondary levels. The following are some of UNESCO's programmes on the environment over the past 40 years.

1951 Arid Zone Programme
1956 Humid Tropics Programme
1960 Intergovernmental Oceanographic Commission
1965 International Hydrological Decade
1971 Man and the Biosphere Programme
1972 Convention Concerning the Protection of the World Cultural and Natural Heritage
1972 International Geological Correlation Programme
1974 UNESCO–UNEP Microbiological Resources Centres Network (UNEP = United Nations Environment Programme)
1975 UNESCO–UNEP International Environmental Education Programme
1975 International Hydrological Programme
1980 Major Inter-regional Project on Research and Training Leading to the Integrated Management of Coastal Systems (COMAR)
1984 IUBS–UNESCO Tropical Soil Biology and Fertility Programme (IUBS = International Union of Biological Sciences)
1991 Global Ocean Observing System (GOOS)
1991 IUBS–SCOPE–UNESCO Programme on Biodiversity (SCOPE = Scientific Committee on Problems of the Environment of the International Council of Scientific Unions (ICSU)).

Oceanography

The Intergovernmental Oceanographic Commission (IOC) was established in 1960 to encourage research into how oceans affect and sustain life on Earth, including their vital role in the global water cycle. IOC is a body with functional autonomy within UNESCO.

The functions of IOC are to develop, recommend and coordinate international programmes for scientific investigation of the oceans, to provide related ocean services and to carry out a programme of education, training and mutual assistance with Members States. In doing so, IOC coordinates with other international entities and the world-wide network of scientific institutions scattered through its 117 Member States. IOC is the only body within the United Nations charged with basic oceanographic research.

IOC has promoted a number of research initiatives aimed at improving the knowledge base of the ocean environment – its state of health and biodiversity – and how oceans interact with land and the atmosphere and drive global and regional climate. Its programmes include the joint IOC–WMO–ICSU World Climate Research Programme (WCRP) and the joint IOC–UNEP–IMO programme on Global Investigation of Pollution in the Marine Environment (GIPME). IMO is the International Maritime Organization and WMO the World Meteorological Organization.

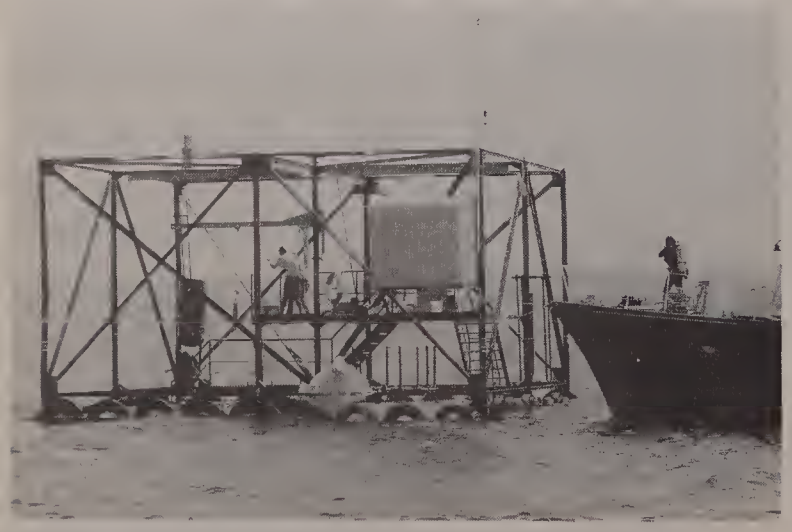
WCRP embodies the largest oceanographic undertaking ever attempted: the World Ocean Circulation Experiment, as well as the Tropical Ocean Global Atmosphere Programme which is aimed at understanding the effect on global climate of the strongly coupled ocean–atmosphere system in the western tropical Pacific. GIPME concentrates on studies of pollution distribution and impacts, particularly in the coastal zone, as well as inputs of pollutants to coastal zones and open ocean areas. It has resulted in the development of a set of methodologies and the production of specific reference standards for much of the global ocean research and monitoring work carried out by Member States. The monitoring aspects of GIPME are carried out mostly at the regional level under the Marine Pollution Monitoring System (MARPOLMAN)

IOC is also embarking on the creation of a Global Ocean Observing System (GOOS). This is a complex system for collecting, analysing and distributing physical, chemical and biological data from all the world's seas, with the aim of improving the understanding and prediction of the state and health of the world ocean, the role of the ocean in global climate change, and predictions of climate.

Coastal pollution in Brazil. The GIPME Programme concentrates on pollution distribution and impacts, particularly in the coastal zone.

All activities relating oceanography and marine sciences within UNESCO are now placed in a single administrative unit under the authority of the Secretary of IOC and Director, Office of Oceanography. UNESCO's coastal marine sciences programmes now have three major components. The first is COMAR which is short for 'Coastal Marine Project'. The objective of this project is to improve the knowledge and understanding of the characteristics, functioning and changes in the systems and ecosystems of coastal zones and to provide the basis for their integrated management.

The second core area is known as TREDMAR which stands for 'Training and Education in Marine Science'. This programme promotes education and training of marine scientists and reinforces the work of COMAR. The third pillar of the marine sciences programme is PROMAR, 'Promotion of Marine Science'. This core programme concentrates on building up national and regional competence in marine sciences and coastal zone management. Its objectives include the promotion of basic science such as research into marine productivity and biological diversity.



The Intergovernmental Oceanographic Commission encourages research into how oceans affect and sustain life on Earth.

International Hydrological Programme

UNESCO's International Hydrological Programme (IHP), formed in 1975, aims to improve basic knowledge of the global hydrological cycle and encourage proper water management. IHP works through a network of 140 National Committees, as well as with non-governmental organizations.

During the present phase (1990–95), IHP is concentrating its efforts on three major objectives:

1 To promote hydrological research in a changing environment. For example, scientists working through IHP are studying the possible effects of storm surges and salt water intrusion into river estuaries and coastal aquifers as a result of rising sea levels.

2 To manage water resources for sustainable development. This includes the provision of improved methodologies for evaluating the current status of fresh water resources, as well as predicting the likely impacts of water development projects.

3 To improve education, training, the transfer of knowledge and public information in the fields of hydrology and other related water sciences.

Since 1975, the IHP has had a major impact on the way fresh water resources are monitored, managed and conserved. For example, hydrochemistry, which is an important element in hydrological mapping, is referred to in many legends of maps compiled under IHP auspices.

IHP accomplishments include the development of guidelines, in collaboration with the World Health Organization (WHO), for the collection and interpretation of water quality data. Operational guides for determining water quality were also produced within the context of the Global Environmental Monitoring System (GEMS), coordinated by UNEP, WHO and WMO.

IHP has also developed new techniques for measuring particulate matter (sediments) in fresh water rivers and lakes, thus greatly accelerating national and international water quality monitoring programmes.

Man and the Biosphere Programme

The current world concern over the deterioration of the global environment is a relatively recent phenomenon. One of the first international meetings on this topic was sponsored by UNESCO in 1968 under the title the 'Biosphere Conference'. For more or less the first time in history, the international scientific community collectively told the governments of the world that the environment was in bad shape and getting worse. Previous international scientific efforts had tended to accumulate data, without seeking to resolve land-use problems. Ecosystems were thought to maintain a stable equilibrium and in this sense human beings were considered as an 'unnatural disturbance'.

In this context, a worldwide effort was needed to mobilize scientists to study the biosphere as a whole, considering human beings as an integral part. As a consequence, UNESCO launched the Man and the Biosphere (MAB) Programme in 1971 to seek answers as to how humanity was affecting the biosphere and what could be done to avoid further degradation.

Notable and recent MAB achievements include the establishment of an international network of biosphere reserves. These are protected areas representative of the world's major ecosystem types. By mid-1991, the network con-

Current projects of the International Geological Correlation Programme include studies of the evolution of deserts and climatic change and also coordination of the collection of rock samples from key geological strata around the world.

sisted of 300 biosphere reserves in 75 countries, covering nearly 164 million hectares. MAB has also set up networks for comparative studies on topics which scientists around the world consider of vital importance, for example: land/freshwater interfaces; and tropical soil biology and maintenance of fertility. The programme has also published technical syntheses, useful for scientists and resource managers, on such topics as the practical control and restoration of eutrophied lakes and rivers.

Earth sciences

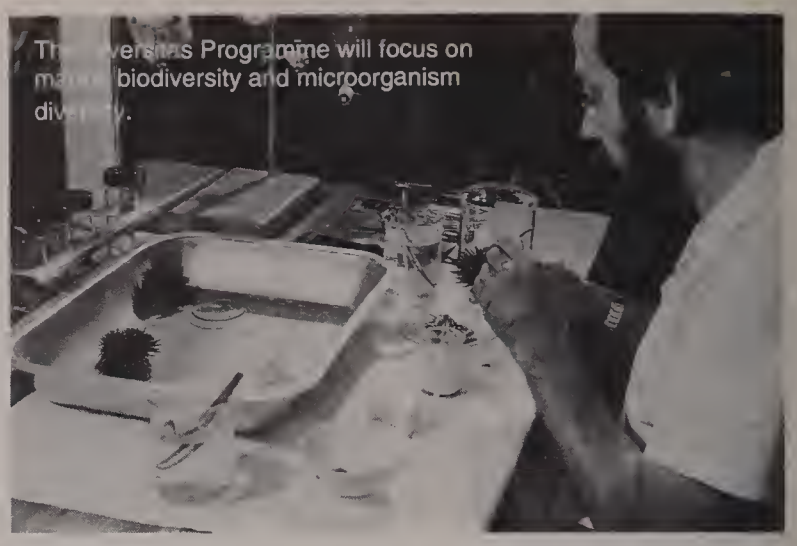
UNESCO's earth science programmes promote and coordinate international research and training activities to improve understanding of the geological environment and the use of geological knowledge for environmentally sound development. The International Geological Correlation Programme (IGCP) is an international programme of basic research on global geological problems implemented through a network of 59 projects assisted by national committees in 92 countries. Current IGCP research projects include studies of global changes in sea level, sedimentation of lakes and rivers, karstification, evolution of deserts and climatic change during and after the last Ice Age, and the application and transfer of new, state-of-the-art research technologies.

IGCP projects have included the compilation of existing information and the generation of new information about the world's deposits of phosphorites, coal, tin, tungsten, bauxites and the sulphidic ores of copper, lead and zinc. For example, one IGCP project produced a three-volume summary of all available information on the world's phosphate deposits, which are of crucial importance in producing agricultural fertilizers.

Another IGCP project has refined estimates about the time scale of the Earth's history by coordinating the collection of rock samples from key geological strata around the world. State-of-the-art laboratory methods were used to date the samples. IGCP has also computerized new data on igneous and sedimentary rocks, and made these data accessible to scientists world-wide.

UNESCO's programme on Geology for Environmentally Sound Development encompasses a wide spectrum of geology activities designed to help countries develop energy and mineral resources in an environmentally sound fashion and improve their land-use planning efforts. The objectives of this programme include the promotion of activities leading to a better understanding of the geological, geophysical and geochemical factors influencing the environment, and the communication of key findings to scientists, development planners and decision makers.

Amongst the achievements of the programme is the initiation of fundamental research on the influence of geofactors on the environment, for example, on the migration of toxic metals in sediments. The programme has upgraded the skills of hundreds of young scientists in developing countries to international standards through the creation of training programmes in the fields of general geology, geophysics, Quaternary geology, geochemical prospecting, remote sensing, economic geology, geothermal energy, mineral prospecting and mining.



Biodiversity

IUBS, SCOPE and UNESCO have recently launched a joint programme to improve scientific knowledge about biodiversity. The programme – known as Diversitas – consists of a mix of research, synthesis of knowledge, inventorying and monitoring, training of specialists such as taxonomists, as well as the preparation of material to sensitize different people to the issues on hand. The programme is set to run for an initial period of 10 years, with inventorying and monitoring activities continuing after that date. Interim results will be synthesized and made available for decision makers so that decisions on land management and use of natural resources are made with the best current knowledge.

Diversitas will cover two aspects of biodiversity that have been somewhat neglected until now: marine biodiversity and microorganism biodiversity. For example, the loss of biodiversity in the oceans is not clear. Marine pollution, eutrophication, sedimentation and silting from coastal runoff may, in fact, have a greater impact on marine biodiversity than direct activities such as fishing. In consequence, a specially tailored research, inventorying and monitoring programme will be initiated within Diversitas to complement the work on terrestrial systems.

Microorganisms are major contributors to biogeochemical cycles and perform unique, indispensable activities in the circulation and transformation of matter. The degree of diversity of microorganisms in genetic terms far exceeds that of larger organisms and less than 5% of these are currently named. Microorganisms have immense potential for increasing food production and also for alternative technologies and waste re-utilization. In consequence, Diversitas contains a subprogramme on microorganism diversity that aims to inventory organisms, develop standard sampling techniques, improve microbiological expertise, promote the conservation of these too frequently ignored organisms and generally provide microbiological input to the rest of the programme.

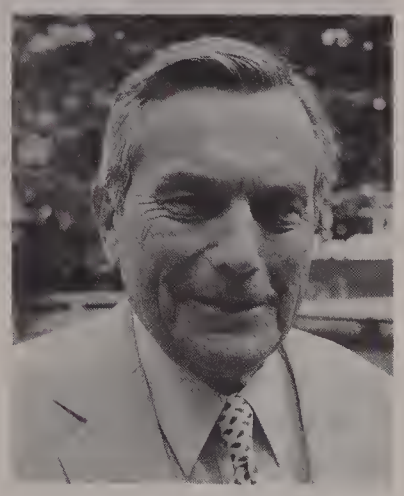
This article was prepared by CI *Editor Mike Freemantle. It is largely based on extracts from documents and publications made available by UNESCO and also on discussions with staff at the UNESCO Secretariat in Paris. The Editor is pleased to acknowledge the cooperation of UNESCO and in particular the invaluable assistance of Prof. V. Zharov (Director) and Mrs M. Ayano of the Division of Basic Sciences at UNESCO.*

Hot-spots in organic chemistry

Nelson J. Leonard

At the Bureau meeting in Oxford, Organic Chemistry Division President Nelson J. Leonard presented a brief overview of recent advances and hot-spots in organic chemistry. This is the text of his address.

Professor Nelson J. Leonard is Faculty Associate in Chemistry, Division of Chemistry and Chemical Engineering, The California Institute of Technology, Pasadena, CA 91125, USA.



Synthesis

While synthesis continues to thrive at the center of the discipline of organic chemistry, the purposes of synthesis are changing. The targets of synthesis include those of natural occurrence, size, geometry, assembly, modelling, and compounds possessing curtain desired properties, whether mechanical, magnetic, photophysical, electrical, biological, or therapeutic. Demands for the automated synthesis of polypeptide and polynucleotide chains and for the de-synthesis, the sequencing, of such chains have engendered the needs of near-100% conversions at every stage. Requirements for the efficient and economic production of biologically active molecules such as pharmaceuticals, insect attractants and repellents, essences and flavours, have stimulated the invention of enantioselective synthetic methodology.

The formation of diastereomers from racemates is still a valid method of resolution, and the concept is used in adsorptive columnar separation. Nature's reagents such as bacteria, fungi, enzymes, and whole cells are finding increasing use in a single enantiomer synthesis from prochiral intermediates or for single enantiomer conversions from racemates. Enantioselective synthesis can be accomplished by chiral auxiliary reagents used in stoichiometric amounts, whereby the reagent induces the desired chirality and then is split off. Chiral auxiliaries in growing impressive array assist in a wide variety of stoichiometric enantioselective conversions. The recent breakthroughs in catalytic asymmetric synthesis employ small amounts of chiral metallo-organic complexes to produce large amounts of enantiomerically pure products. Conversions are now being achieved that approach the desired 99–100% enantiomeric excess, "ee." Double stereodifferentiating reactions and control of stereoisomers in acyclic systems represent additional advances in asymmetric synthesis.

In organic synthesis, there have been other overall improvements in synthetic methodology, notably for complex ring systems; transition metal-mediated processes including polyene cyclizations; new methods of polymerization including two-dimensional chain synthesis and ring-to-linear conversions; and computer-assisted retrosynthetic programming as part of information retrieval.

Bioorganic chemistry

Bioorganic chemistry is an expanding dynamic area of fundamental and practical interest. Organic chemistry approaching 100% conversion at each step provides the basis of modern biotechnology, which includes the automated synthesis of polypeptide and polynucleotide chains and the sequencing of DNA and RNA. The potential for the construction of oligosaccharides now exists through the mediation of appropriate enzymes.

Combinatory chemistry relies upon the generation, by chemical and biological methods, of libraries of products – peptides, for example – in various combinations for the testing of binding and activity. The process, which is carried out on a micro scale, creates diversity, is rapid, and permits the surveying of vast numbers of compounds with respect to some measurable activity, for example, with receptors and enzymes. Combinatory chemistry thus offers new potential for drug discovery.

New types of "enzymes" adaptable to performing special desired functions have been conceived by means of mammalian immune reactions. Antibodies to transition-state analogues or short-lived reaction intermediates are generated, and the polyclonal antibodies with highest affinity are replicated monoclonally. These "abzymes", as they are called, are catalytically effective in accomplishing enantioselective conversions of wide diversity, presently exemplified by peptide- and amide-bond cleavage, ester hydrolysis, redox reactions, lactonization, Claisen rearrangements and even Diels–Alder reactions.

The list is growing. It is a justifiable assumption that the catalytic antibodies will also act when suitably attached to a column support, as with enzymes, so that continuous selective conversions can be envisaged.

Computer simulation of biomolecular systems is being used effectively to design and then produce enzyme inhibitors, trans-membrane channels, functional peptides, model membranes, artificial pores, and self-assembly systems, inter alia. Protein–DNA interactions and protein–protein interactions, as determined by X-ray and NMR analysis and predicted by computer modelling, stimulate the synthesis of oligonucleotides, and for investigating the stereochemistry of nucleotide conversions. The past decade has seen the design and synthesis of compounds that accomplish sequence-specific DNA cleavage, including the

cleavage of long runs of polynucleotide duplexes for which no restriction enzyme methodology is available. Triple helix formation provides the basis for biochemical chromosome analysis, artificial repressors, and potential therapeutics for antiviral and gene therapy. The examples cited here are but representative of the many cases where the principles of physical organic chemistry, the practices of synthetic organic chemistry, the procedures of spectroscopic analysis, and the observations of biological activity or behaviour are being combined for the solution of biological problems.

Physical organic chemistry

In physical organic chemistry, special spectroscopic methodology is being used for determination of fast kinetics in general and for the detection and determination of very short-lived intermediates in particular. The use of photoacoustic calorimetry, for instance, has become a viable technique. Ion radical reactions have become important (and respectable). Further methods are being developed to gain understanding of the interactions of metals with carbon–carbon bonds in bond activation reactions. Computer modelling is finding increased use in "visualization" of structures necessary for the incorporation of special properties, such as magnetic, where non-bonded electron spins are aligned. As in the case of bioorganic chemistry, computer modelling of the interaction of small molecules with macromolecules provides inspiration for the synthesis of both members of a small–large pair. Physical organic chemistry is being enriched by the implementation of high-powered theory (ab initio) at a level of application to multicarbon organic compounds and by the influence of force field calculations. New insights in electronic structure and theory and improved understanding of the chemistry of

Special spectroscopic methodology is being used for determination of fast kinetics.

the solid state are spurring efforts in the rational design and synthesis of organic materials with novel optical, conducting, superconducting, and magnetic properties.

Finally, there is a merging of organic and inorganic chemistry in synthetic methodology and in structural analogy – in the former area especially with compounds containing transition metal ions (mentioned earlier) and in the latter area with organic compounds containing silicon, phosphorus, boron, and tin. In the realm of new compositions of matter, one must recognize the networks and self-assemblies that are being produced and the fullerenes, such as C_{60}, C_{74}, C_{76}, C_{78}, which are being brought into the organic realm through capture by carbene and by oxidation reactions.

The entire discipline is presently marked by exciting invention and expanding development.

Garlic and onion chemistry

The following review is the introduction of a paper on 'Organosulfur chemistry of garlic and onion: Recent results' co-authored by Eric Block, Sriram Naganathan, David Putman and Shu-Hai Zhao. The paper was presented by Block at the 3rd International Conference on Heteroatom Chemistry held in Riccione, Italy, on 7–12 June 1992 and published in the April 1993 issue of *Pure Appl. Chem.*

Garlic (*Allium sativum*) and onion (*Allium cepa*) were among the earliest of cultivated foods and spices, easily identified by primitive food-seekers by their distinctive smell, now known to be associated with organosulfur compounds. The popularity of garlic and onions in folk medicine through the centuries for treatment of such varied disorders as dog bites, insect stings, earaches, burns and wounds, baldness, headaches, chest colds, respiratory ailments, asthma, pneumonia, diabetes, cardiovascular disorders, and rheumatism, among others, can be attributed to their pungent aroma, strong taste and, in the case of onion, its potent lachrymatory effect. These plants are members of the well known and widely appreciated genus allium, comprising more than 600 different species, other common members being leek, chive, shallot, and scallion.

Common allium species were valued by early civilizations both as important dietary constituents and as medicinals for the treatment of many disorders, for example as recorded in the Bible, '...[the Jews who fled Egypt to wander the Sinai wilderness for forty years fondly remem-

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[b]*Pure Appl. Chem.* **65**, 625 (1993).

bered] the fish which we did eat in Egypt so freely, and the pumpkins and melons, and the leeks, onions and garlic,' and as documented by discovery of dried garlic cloves and wooden models of onions among the relics found in the burial chambers of the pharaohs, and by references to medicinal use of these plants in the writings of Aristotle, Hippocrates, Aristophanes, and Pliny the Elder.[1]

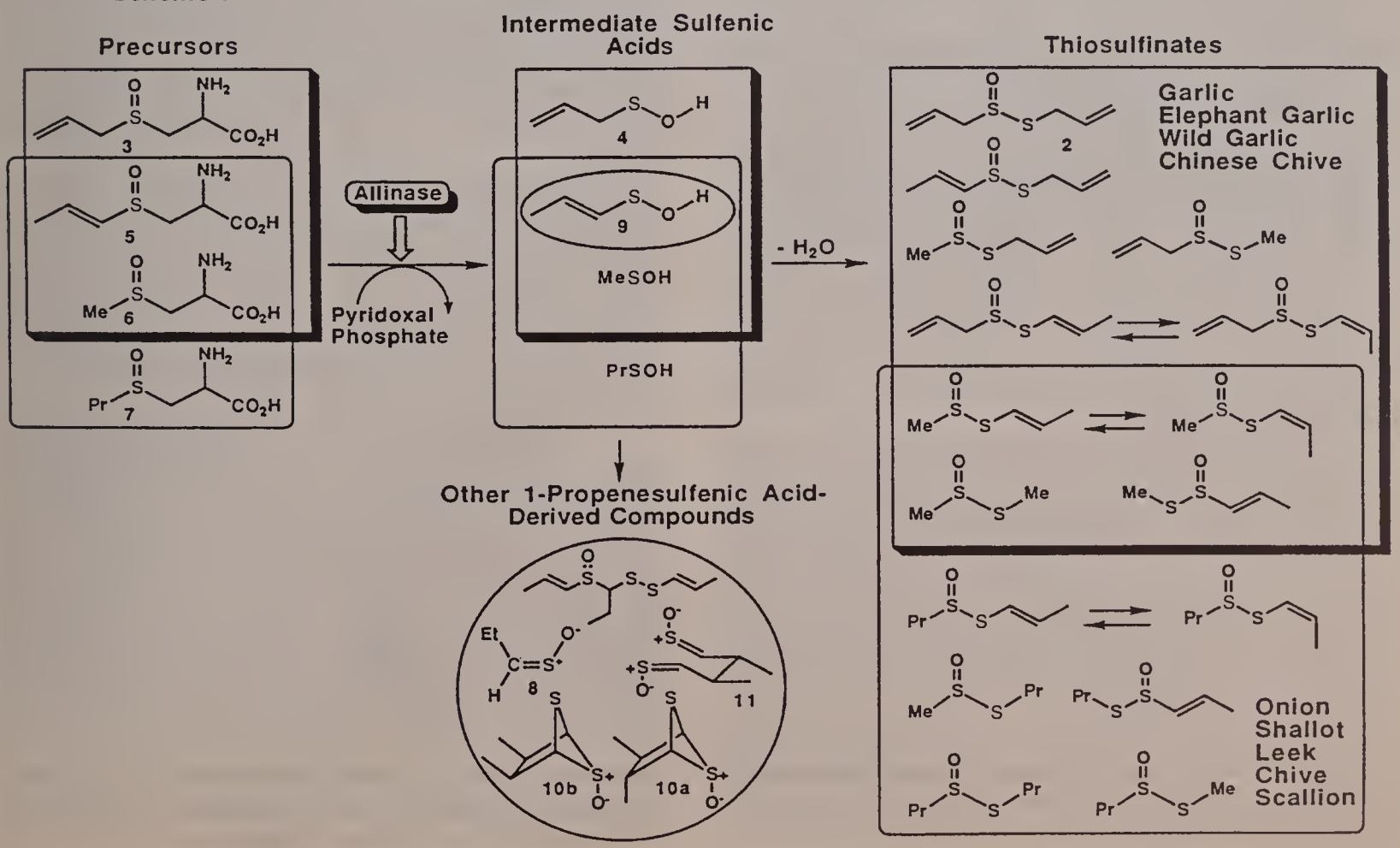
Both the popularity of allium plants as foodstuff as well as the reputation of garlic and onion as 'cure-alls' stimulated scientific investigations, such as the early work by Pasteur in France (*c.* 1858) into garlic's antibacterial activity and by Wertheim (1844) and later Semmler (1892) in Germany into the composition of distilled garlic and onion oils (mainly diallyl disulfide, CH_2=CH–CH_2SSCH_2CH=CH_2, **1**, in the former case, and propenyl propyl disulfide in the latter case). Only with the advent of modern spectroscopic and chromatographic techniques has it become possible to determine the molecular basis for the odour, taste and biological activity of the fresh or processed plants. Key early discoveries on this subject were made by Cavallito (1944) and Wilkens (1962) in the United States, by Stoll and Seebeck in Switzerland (1948) and by Virtanen in Finland (1960).[2,3]

Cavallito discovered an unstable, odoriferous liquid substance in extracts of fresh garlic he termed allicin (CH_2=$CHCH_2S(O)SCH_2CH$=CH_2 ≡ AllS(O)SAll, 2-propene-1-sulfinothioic acid S-2-propenyl ester; **2**) possessing antibacterial properties, while Stoll and Seeback identified the immediate precursor of allicin as alliin, (CH_2=$CHCH_2S(O)CH_2CH(NH_2)COOH$, (+)-S-allyl-L-cysteine S-oxide; **3**). Present evidence indicates that allicin **2** is formed by action of the C-S lyase enzyme alliinase (released by cutting or crushing garlic cloves) on the stable precursor alliin **3** by way of the intermediate 2-propenesulfenic acid (**4**, Scheme 1). Alliin **3** occurs abundantly in garlic, up to $0.76 \pm 0.40\%$ of fresh weight. From onion preparations Virtanen isolated three homologues of alliin, namely (+)-S-(prop-1-enyl)-L-cysteine S-oxide, **5** (CH_3CH=$CHS(O)CH_2CH(NH_2)COOH$), (+)-S-methyl-L-cysteine S-oxide, **6** ($CH_3S(O)CH_2CH(NH_2)COOH$) and (+)-S-propyl-L-cysteine S-oxide, **7** ($CH_3CH_2CH_2S(O)CH_2CH(NH_2)COOH$. Wilkens and Virtanen independently investigated the structure of the onion lachrymatory factor (LF, C_3H_6SO; **8**). 1-Propenesulfenic acid S-H tautomer (CH_3CH=$CHS(O)H$) and propanethial S-oxide (CH_3CH_2CH=S=O) were suggested by Virtanen and Wilkens, respectively, as the structure of **8**. More recent work by the author has established that the LF**8** has the structure (Z)-propanethial S-oxide, and that it most likely originates from rearrangement of 1-propenesulfenic acid O–H tautomer **9**.[4]

Allicin **2** is a member of a class of unstable and reactive organosulfur compounds known as thiosulfinates. Allicin is an antimicrobial agent which affects RNA synthesis in microorganisms and lipid biosynthesis in mammals, yeast and higher plants, inhibiting acetyl–CoA synthetase in the latter.[3] Thiosulfinates such as **2** can be synthesized by oxidation of the corresponding disulfide with peracids, e.g. **1** in the case of allicin. Since the above key initial discoveries, much effort has been expended developing procedures to detect and accurately quantitate allicin in fresh and processed garlic and to understand how allicin forms and decomposes. These studies have taken on added importance because of the considerable current interest in biological properties of organosulfur compounds from garlic, especially as related to cardiovascular disease, cancer and infectious diseases.

After the discovery of alliin **3** and related cysteine S-oxides $RS(O)CH_2CH(NH_2)COOH$ **5–7** in allium species, it was recognized that upon cutting the plants, allinase-induced cleavage of these precursors could give

Scheme 1



thiosulfinates of type R'S(O)SR", where R' and R" represent such groups as methyl, *n*-propyl, 1-propenyl and 2-propenyl. These thiosulfinates, and derived polysulfides, were assumed to be the principle source of flavor and aroma in allium species and were viewed as important taxonomic markers. Indirect methods were used to identify and quantify the allium thiosulfinates, e.g. paper chromatographic separation of cysteine derivatives, RSS $CH_2CH(NH_2)$–COOH, of the thiosulfinates[5] or gas composition.[6] Paper chromatography suggested the presence in garlic, onion and Chinese chive extracts of thiosulfinates such as MeS(O)SMe, PrS(O)SPr, AllS(O)SAll, MeS (O)SAll, MeS(O)SPr, AllS(O)SPr, although not all compounds were present in extracts of each plant.

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Provisional Recommendations

IUPAC seeks your comments

In this section we publish synopses of IUPAC's latest provisional recommendations on nomenclature and symbols. All comments on these recommendations are welcome and will be taken into consideration. The final revised versions are published in *Pure and Applied Chemistry* and synopses of these are published in *Chem. Intl.* as recent reports.

If you would like to comment on the provisional recommendations please write to your nearest national/regional centre requesting a copy of the full report. Copies are not available from the IUPAC Secretariat. The most up-to-date list of the national/regional centres appeared in *Chem. Intl.* **14**, 25 (1992).

Recommendations for nomenclature of ion-selective electrodes

The rapid growth of interest in the field of ion-selective electrodes (ISEs), within the larger field of electrochemical sensors based on potentiometric, amperometric, and conductometric principles, make it highly desirable to achieve improved standardization of nomenclature in this area. This paper is an updated version of an earlier document (Recommendations 1975: *Pure Appl. Chem.* **48**, 127–132 (1976)) which has been corrected using recent experimental and theoretical findings.

The paper contains general recommendations for definitions and terms used in the field, in alphabetical order ranging from activity to suspension effect. However, the report does not recommend activity standards or calibration procedures using activity standards. A comprehensive classification of ion-selective electrodes and the methods for the determination of the selectivity coefficients of ion-selective electrodes are also given.

Comments on the document are welcome and should be sent by 31 January 1994 to: Richard P. Buck, Department of Chemistry, University of North Carolina, Chapel Hill, NC 27599–3290, USA.

Phane nomenclature. Part I: Parent phane names

Systematic nomenclature of organic chemistry consists of various methods used for composing the name of a given structure from component names denoting parts of the latter. Phane nomenclature is another such method. It is based on the idea that a relatively simple initial skeleton is amplified by a type of operation which consists of a replacement of skeleton atoms by inserted multi-atomic skeletons.

In each individual operation of this type, one atom of the initial skeleton is replaced. In the name, it is expressed by a particular type of prefix which specifies the inserted skeleton. Likewise, the initial skeleton is represented by a specific type of stem name. The latter ends with "phane" and is otherwise formed like a hydrocarbon name. Accordingly, all of its atoms except for those replaced (as indicated by the mentioned prefixes) are supposed to be carbon atoms by convention.

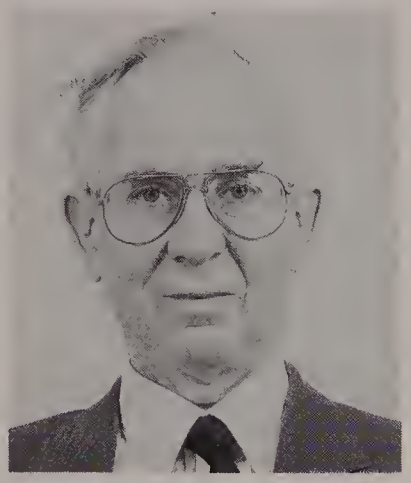
A phane prefix is derived from the name of the parent hydride having the inserted partial skeleton. This name is transformed to the phane prefix by addition of the terminal letter "a", with elision of a terminal "e", if present. By their ending, phane prefixes thus resemble the prefixes which analogously indicate the replacement of one type of skeleton atom by another (cf. "oxa", "aza", etc.).

In a typical phane parent hydride name, like "1(1,4)-benzena-4(2,7)-naphthalenacycloheptaphane" (belonging to the adjacent formula graph), the locants before the parentheses identify the positions of the atoms of the initial skeleton (a seven-membered saturated monocycle) which yield their place to the partial skeletons specified by the subsequent phane prefixes. The locants within the parentheses specify the atoms which hold the bonds by which these partial skeletons are linked into the initial skeleton.

Comments on the document are welcome and should be sent by 31 January 1994 to: Mr E. W. Godley, 10 Lawrence Avenue, New Malden, Surrey KT3 5LY, UK.

PAC review

Pure and Applied Chemistry (*PAC*) is IUPAC's official journal. It publishes the main invited lectures of symposia sponsored by the Union; the recommendations of its Commissions on nomenclature, symbols and units, and technical reports on standardization, recommended procedures, collaborative studies and data compilations. Summaries of the most recent IUPAC recommendations on nomenclature and symbols, and technical reports appearing in *PAC* are published in *Chem. Intl.* in the section Recent Reports. In this section we take a brief look at the symposia and lectures published in recent issues of *PAC*.



Commission I.2 honoured Professor Rowlinson as Rossini Lecturer in 1992 in recognition of his many achievements in and contributions to thermodynamics.

Chemical thermodynamics

The May 1993 issue of *Pure Appl. Chem.* contains the texts of the main lectures including the Rossini Lecture, presented at the 12th International Conference on Chemical Thermodynamics held on 16–21 August 1992 at Snowbird, Utah, USA. The Conference was held jointly with the 47th Calorimetry Conference under the sponsorship of IUPAC through the Physical Chemistry Division (I) and the Commission on Thermodynamics (I.2).

IUPAC affiliate and Conference Editor Earl Woolley (Brigham Young University, USA) writes in the Preface that the importance of carefully made, precise experimental measurements of thermodynamic quantities is as critical today as it has ever been. Data for new substances, reactions, and processes are necessary for developing new materials and procedures in areas ranging from environmental science to electronics and for applications ranging from energy production to biological processes.

Young points out that this current interest in thermodynamics was evident in the Conference program and in the breadth of backgrounds of the participants. The program consisted of 12 plenary, 254 oral, and 165 poster presentations in 11 symposia dealing with theoretical, experimental, and applied thermodynamics in the following areas: biological, electrolyte solutions, fluid phases, industrial environments, macrocycles, methods and instrumentation, nonelectrolyte mixtures, nuclear materials, solids, and surfaces. Registered scientific programme participants numbered 471 and the 431 presentations listed in the programme were submitted by authors from 39 countries. In addition, registered accompanying persons numbered 141. Abstracts of all 431 presentations were published in the Conference Program book.

Rossini Lecture

The 1992 Rossini Lecture was presented by J. S. Rowlinson, Dr Lee's Professor of Physical Chemistry, Oxford University, UK. The lecture, which was entitled 'Thermodynamics of inhomogeneous systems', was an enquiry into the extent to which we can define uniquely local thermodynamic functions in an inhomogeneous system at equilibrium. Rowlinson argued that this can be done if the length scale of the inhomogeneity is macroscopic, but generally cannot be done if the scale is of the range of intermolecular forces, as, for example, in systems with interfaces. In these cases the temperature and the chemical potential remain constant throughout the system and the local density is well-defined, but the pressure, and so other thermodynamic functions, are not. He analysed recent proposals by Baus and Lovett to find a unique form of the pressure and showed that these lead to other, as yet unresolved, difficulties.

IUPAC contributions

Several IUPAC members including affiliates contributed papers at the Utah Conference which were published in the May issue of *Pure Appl. Chem.* These included:

1 The fundamental equation of thermodynamics for biochemical reaction systems – *Robert A. Alberty,* USA (IUPAC affiliate and President, Division I)

2 Osmotic coefficients of non-aqueous electrolyte solutions at thermodynamic and McMillan–Mayer level – *J. Barthel, Germany* (Titular Member, Commission I.2)

3 Thermodynamic properties of the S/L interfacial layer: Stabilization of the colloidal system in binary liquids – *Imre Dékány, Hungary* (Associate Member, Commission on Colloid and Surface Chemistry including Catalysis, I.6)

4 Thermophysical properties of fluids from acoustic measurements – *M. B. Ewing* (Titular Member, Commission I.2)

5 Thermodynamics of high temperature electrolyte solutions: Vapour–liquid equilibrium – *Roberto Fernández-Prini, Argentina* (National Representative, Commission I.2)

6 Adiabatic calorimetry and solid state properties above ambient temperature – *Fredrik Grønvold, Norway* (National Representative, Commission I.2)

7 Thermodynamics of coordination of metal ions with binucleating macrocyclic and macrobicyclic ligands – *Arthur E. Martell, USA (IUPAC affiliate)*

8 Solution calorimetry of alkyl substituted ammonium bromides in aqueous and nonaqueous solvents – *G. Somsen, Netherlands* (Secretary, Division I)

9 Effects of mutations on the thermodynamics of proteins – *Julian M. Sturtevant, USA (IUPAC affiliate)*

Recent Reports

In this section we publish summaries of the most recent IUPAC recommendations on nomenclature and symbols and technical reports. The full texts of these recommendations and reports are published in *PAC*.

Nomenclature, symbols and definitions in electrochemical engineering (IUPAC Recommendations 1993)

This document treats performance parameters in electrochemical engineering. Nomenclature and definitions for electrochemical engineering together with the respective symbols are given. Parameters to account for electrochemical reactions in electrolysis as well as for electrochemical power sources (electrochemical energy generators) are included in this document.

This report was prepared for publication by Gerhard Gritzner and Gerhard Kreysa, Commission on Electrochemistry, Physical Chemistry Division, and published in Pure Appl. Chem, ***65***, *1009–1020 (1993).*

Analytical techniques for trace organic compounds – IV: Tandem mass spectrometry for organic trace analysis (Technical Report)

Tandem mass spectrometry is a very sensitive method for the identification of organic compounds in mixtures. The first mass spectrometer serves to ionize all components of the mixture and to select out a major ion, most often the molecular ion of the compound(s) of interest, which is then fragmented by injection into a region containing a neutral gas at intermediate pressure and the resulting fragment ions are then separated and mass analysed in the second mass spectrometer. This approach makes quantitative analysis more specific and reliable by monitoring a specific fragment ion from the precursor ion of interest. It also allows qualitative analysis by interpretation of the fragment ion spectrum of a particular component independent of the presence of the others. Tandem mass spectrometers consist of either three quadrupoles, the second one serving as the collision region; two magnetic instruments; or a combination of both. Some of the measurements can be carried out with one with one double-focusing mass spectrometer but at the expense of resolution.

This report was prepared for publication by Klaus Biemann, Working Group on Organic Trace Analysis, Commission on Microchemical Techniques and Trace Analysis, Analytical Chemistry Division, and published in Pure Appl. Chem, ***65***, *1021–1027 (1993).*

Electrode coating plant at Winnington, Cheshire, UK. (*Photo courtesy of ICI Chemicals and Polymers.*)

Critical survey of the stability constants of complexes of aliphatic amino acids (Technical Report)

Stability constants for the proton and metal ion complexation equilibria of aliphatic amino acids including α-alanine, valine, 2-aminopentanoic acid, leucine, isoleucine, 2-aminohexanoic acid and β-alanine were collected and critically evaluated. Data evaluation criteria involved the specification of the essential reaction conditions, the correctness of calibration techniques and calculation and the applicability of the methods used for the determination of stability constants. Recommended values for the proton and some metal ion complexes are collected in separate tables. Enthalpy values published on the protonation equilibria and metal ion complex formation processes of aliphatic amino acids were also surveyed.

This report was prepared for publication by I. Sóvágó, T. Kiss and (late) A Gergely, Commission on Equilibrium Data, Analytical Chemistry Division, and published in Pure Appl. Chem, ***65***, *1029–1080 (1993).*

Radionuclide migration in groundwaters: Review of the behaviour of actinides (Technical Report)

The most likely process that can lead to the release of radionuclides from a radioactive waste repository in a geological formation is transport by groundwaters.

Because of this, the migration of radionuclides in groundwaters is extensively studied; consequently works and studies to be performed in the evaluation of this phenomenon must deal with aqueous chemistry, geochemistry, hydrology, physics and modelling.

The current state of the art concerning actinide migration is given in this report in order to highlight the various aspects of the subject and to point out the research required to bridge the gaps in our current knowledge. *This report was prepared for publication by M. Dozol and R. Hagemann, Commission on Radiochemistry and Nuclear Techniques, Analytical Chemistry Division, and published in* Pure Appl. Chem, ***65***, *1081–1102 (1993).*

Publications

Language, symbols and representations in chemistry

The June 1993 issue of the *International Newsletter on Chemical Education* (No. 39) is devoted to 'Recommendations for language, symbols and representations in chemistry: Proposed handbook for teachers'. This is a pilot publication of the IUPAC Committee on Teaching of Chemistry (CTC) which is being given wide exposure to potential users in order to determine how appropriate it is. The emphasis is on the meaning of selected basic chemical concepts and the associated symbolism. The meaning is discussed rather than defined in one sentence in order to make the correct meaning understandable as far as possible. The target audience for the handbook are teachers of chemistry at primary, secondary and tertiary levels, with an emphasis upon secondary and lower tertiary levels. The format consists of an alphabetical listing of concepts, with each entry comprising:

1 Historical origin of concept.
2 Description of meaning related to stage of development of learners, with examples and nonexamples, and possible confusions and misconceptions.
3 Diagrammatic and/or symbolic representation related to **1**.
4 Related concepts.
5 Selected references.

The following entries are published in this issue of the newsletter: acid; atom; chemical bond; compound; element; mixture; molecule; oxidation; physical change; pure substance; reaction.

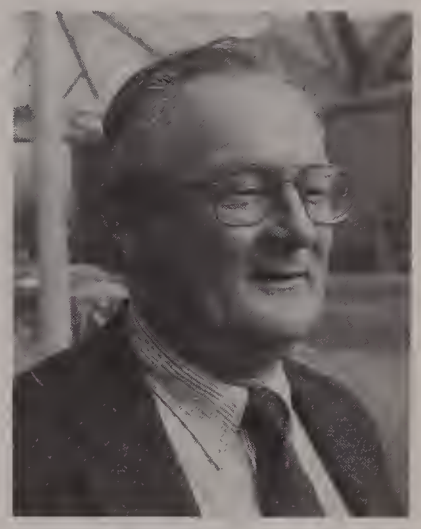
Physicochemical data centers

The IUPAC Working Party on Data Compilations in Physical Chemistry was established by the Physical Chemistry Division Committee at the IUPAC General Assembly held in Boston, USA, 1987. The aim of the project was to compile a list of data centers which are active in data evaluation, compilation, and data distribution in the area of physical chemistry. In particular, the Working Party wished to identify the type of data evaluation, the means by which scientists and information specialists can obtain access to the data, and the mechanisms of distribution.

The survey has now been published in *CODATA Bulletin*, **24**, No. 3, July–Sept. 1992. The editor is Ken Marsh who is a Member of the Physical Chemistry Division Committee. The survey will also be available as part of the CODATA Referral Database, which runs on PC compatible computers. CODATA is the Committee on Data for Science and Technology of the International Council of Scientific Unions (ICSU).

Each entry in the survey contains the name, address, telephone, fax, telex and staff details of the center together

Ken Marsh



with information under the following headings: principal data activity; volume of holdings; description of activity; keywords; output; titles of printed compilation; titles of databases; services; how to access on-line system; access, restrictions, language etc. There is also a subject index.

1993 edition of the IUPAC Green Book

The first IUPAC *Manual of Symbols and Terminology for Physicochemical Quantities and Units* (the Green Book), of which the recently published 1993 edition is the direct successor, was published in 1969, with the object of 'securing clarity and precision, and wider agreement in the use of symbols, by chemists in different countries, among physicists, chemists and engineers, and by editors of scientific journals'. Subsequent revisions have taken account of many developments in the field, culminating in the major extension and revision represented by the 1988 edition under the simplified title *Quantities, Units and Symbols in Physical Chemistry*.

The 1993 edition is a further revision of the 1988 edition, incorporating the recent resolutions of the CGPM, the new international standards ISO-31, and new recommendations from the International Union of Pure and Applied Physics (IUPAP), and from other IUPAC Commissions. Major additions have been made to the sections on Quantum Mechanics and Quantum Chemistry, Electromagentic Radiation, and Chemical Kinetics, in order to include physical quantities used in the rapidly developing fields of quantum chemical computations, laser physics, and molecular beam scattering. New sections have been added on Dimensionless Quantities, and on Acronyms and Abbreviations used in chemistry, and a full subject index has been added to the previous symbol index.

Quantities, Units and Symbols in Physica! Chemistry *is edited by Ian Mills, Tomislav Cvitaš, Klaus Homann, Nikola Kallay and Kozo Kuchitsu and published by Blackwell Scientific Publications, Oxford, UK, 1993. 176 pp. ISBN 0-632-035838. Price: GBP 14.95 (pbk). It is distributed in North America by CRC Press, Boca Raton, Florida, USA.*

Abbreviated List

A corrected reprint of *Quantities, Units and Symbols (the Abbreviated List)*, compiled by Klaus Homann will also be published in 1993. This is a four-page laminated list based on the Green Book. It is intended as a ready reference to the symbols most frequently used by authors, teachers and students in chemistry and related disciplines. It is an invaluable information source on the internationally recommended symbols for the most important physical quantities and units used by chemists and includes such subjects as: base SI units and physical quantities; SI prefixes; SI-derived units with special names and symbols; recommended symbols for commonly used physical quantities; units outside the SI; and values of some fundamental constants. It will be available only as packs of 10 or 50.

Japanese edition of Red Book

無機化学命名法
—IUPAC 1990 年勧告—

A Japanese edition of *Nomenclature of Inorganic Chemistry: Recommendations 1990* (the Red Book) issued by the Commission on the Nomenclature of Inorganic Chemistry and edited by G. J. Leigh was published in March 1993. The book was translated by Prof. K. Yamasaki (Nagoya University). The publishers are: Tokyo Kagaku Dozin Co., Ltd, 36–7, Sengoku 3-Chome, Bunkyo-Ku, Tokyo, Japan.

Spanish edition of Purple Book

The *Compendium of Macromolecular Nomenclature* (the Purple Book), which was prepared for publication by W. V. Metanomski, has been translated into Spanish by Prof. Alemán Vega (Instituto de Ciencia y Tecnología de Polímeros, Madrid) who is an Associate Member of the Commission on Macromolecular Nomenclature of IUPAC.

The Spanish edition, *Compendio de Nomenclatura Macromolecular* (ISBN 80-00-07352-5), is published jointly by Consejo Superior De Investigaciones Científicas (the Spanish National Adhering Organization of IUPAC) and Real Sociedad Española De Química.

The colour of water – New draft International Standard on a test method for water

Water fascinates. The quality of water, the "colour" of water, are a permanent mystery and source of wonder. We have all studied it at some point, admired how it can take on all the colours of a rainbow: deep green, light green, muddy red, turgid yellow, and blue, turquoise, and be as clear as crystal, transparent and limpid, even white or colourless, or cloudy or downright murky.

Scientific fact brings us down to earth again – or rather, to water. ISO/DIS 7887. *Water quality – Examination and determination of colour*, is a revision of the first edition ISO 8778: 1985, and prepared by TC 147/SC 2, *Physical, chemical, biochemical methods*. This draft international Standard has been submitted to the members of the ISO and CEN for parallel voting, according to the provisions of

Scientists from the Centre National de Recherches Océanographiques (CNRO), Nosy-Bé, Madagascar take water samples for an IOC (Intergovernmental Oceanographic Commission) project. The 'true colour' of water is due to dissolved substances whereas the 'apparent colour' is due to undissolved substances and undissolved suspended matter. (*UNESCO photo/ Dominique Roger*)

subclause 5.1 of the Vienna Agreement. There are many standards on water, drinking water, properties of water, but ISO/DIS 7887 occupies an important place. Pure water, the draft International Standard informs us, observed by transmitting light through a depth of several metres, exhibits a light blue colour which may be modified in the presence of pollutants to produce an infinite variety of colours. Natural waters, we learn, are mostly coloured yellowish brown by particular components of iron, clay particles, or by humic matter (or coloured green due to a content of algae) and the observed colour may not be entirely due to completely soluble substances.

For the purposes of analysis, it is only the "true colour" of a sample which is of interest. The true colour is that due to dissolved substances (i.e. all substances that pass a 0.45 μm filter). Colour due to undissolved substances and undissolved suspended matter determined in the original water sample without filtration and without centrifugation, is described as "apparent colour". The inherent colour of water can be neglected in analytical practice.

How then do you study water? This draft International Standard specifies three methods. The first, section one, specifies a method for the examination of apparent colour by visually observing a water sample in a bottle. This gives

only preliminary information, for use, for instance, in field work. Only the apparent colour can be reported. Section two specifies a method for the determination of the true colour of a water sample by the means of optical apparatus, and is applicable to raw and potable water and to industrial water of low colour. Section three specifies a method for the determination of the colour by visual comparison with hexachloroplatinate standard solutions. These methods may either be used independently or in combination.

Section one, then, is straightforward: the unfiltered water sample in a bottle is examined in diffused light against a white background for colour intensity and hue and the result states clearly that it's as "apparent colour" and analysed for both hue and intensity. With section two, the intensity of the colour of a water sample is determined by its light absorption at the wavelength of maximum absorption and quantified by measuring the absorption coefficient with a filter photometer or spectrometer. Different colours cause maximum absorption at different wavelengths of the incident radiation; this standard to determine the colour of the water requires the use of a photometer measurement at three different wavelengths. Section three or the visual method for the determination of the colour in natural water requires comparison against a series of matching solutions.

Reprinted from ISO Bulletin, *p. 10, April 1993.*

Chemical dictionaries on CD-ROM

Publishers Chapman & Hall have announced the release of two dictionaries on CD-ROM. The *CHCD Dictionary of Organic Compounds on CD-ROM* contains all data and entries from the *Dictionary of Organic Compounds Main Work* (1982) to the latest 10th Supplement published in December 1992, as well as previously unpublished material. The publishers claim that, with chemical, structural, physical and bibliographic data on over 145 000 organic compounds, their CD-ROM dictionary is the most up-to-date, selective source of properties on organic compounds available to scientists working within both academia and industry.

The *CHCD Dictionary of Inorganic Compounds on CD-ROM* includes chemical, physical, structural and bibliographic data for over 41 000 inorganic compounds.

Software has been developed to allow users to interrogate the databases easily by text, substructure or a combination of the two. In both CD-ROM dictionaries, the data for each entry includes, where appropriate, chemical names, synonyms, molecular weight and formula, physical description and properties such as melting point and dissociation constants, hazard and toxicity data, CAS Registry Numbers, structural displays and labelled references.

CHCD Dictionary of Organic Compounds on CD-ROM *(ISSN Number 0967 6686. First release March 1993. Price: Corporate First Year USD 5995, Renewal USD 1495; University First Year USD 4395, Renewal USD 950) and* CHCD Dictionary of Inorganic Compounds on CD-ROM *(ISSN Number 0967 6694. First release: Summer 1993) are published by Chapman & Hall, London, UK.*

Clean air measurement

The topic chosen for the 7th OIML (*L'Organisation Internationale de Métrologie Légale*) technical seminar was air pollution measurements including measuring instruments for vehicle exhaust gas, continuous monitoring of ambient air and control of stack gas emissions. The seminar was held in Interlaken, Switzerland, 28 September – 1 October 1992. A report on this workshop including summaries of presentations together with some of the texts of these presentations was published in *Bulletin OIML*, **129**, December 1992 (see *Chem. Intl.* **15**. 104, 1993).

The March 1993 issue of *Bulletin OIML*, **130**, contains the texts of some other papers presented at the seminar:

- 'Gas analyzer with excellent long-term stability for measurement of exhaust gases from Otto engines and turbidity measuring equipment for Diesel engine' byK. Wendt (Germany).
- 'Measurement traceability vs. legal traceability in air quality measurements' by H. L. Rook (USA).
- 'Environmental charge on nitrogen oxide emissions – the Swedish experience' by R. Svedgerg (Sweden).
- 'Continuous monitoring systems for SO_2 and NO_2 emission control' by G. Nyquist (Sweden).
- 'A universal standard verification instrument for sphygmomanometers' by R. Lewisch (Austria).

For further information on OIML, please contact: Bureau International de Métrologie Légale, 11, Rue Turgo, 75009 Paris, France. Tel.: +33 (1) 48 78 12 82/42 85 27 11. Fax +33 (1) 42 82 17 27.

Data for discovery

Data for Discovery, edited by Phyllis Sloane Glaeser of the Committee on Data for Science and Technology (CODATA), Paris, France, focuses on presenting the data requirements for the rapidly expanding studies of human impact on the biosphere and geosphere. The first section of this volume discusses plans and programs for quality control, storage, generation, dissemination, and use of the data involved in major aspects of global change.

The second section of the book features discussion on generic aspects of data handling, including expert systems, storage and retrieval strategies, and knowledge tools. New developments in information that may have applications in various types of scientific data management are addressed.

Subsequent sections deal with database developments in specific scientific fields, particularly in materials science, chemistry and chemical engineering, and molecular biology. Finally, there are several papers reviewing CODATA's role in international data management programs.

Data for Discovery *(Proceedings of the 12th International CODATA Conference, Columbus, Ohio, USA, 15–19 July 1990) is edited by P. S. Glaeser and published by Begell House, Inc., New York, USA, 1992. xxxiii + 478 pp. ISBN 1-56700-002-9. Price: USD 95.00. It can be ordered from CRC Press, Inc., 2000 Corporate Blvd., N.W., Boca Raton, Florida 33431, USA.*

ISO Standards

The following are some of the new international standards announced by the International Organization for Standardization (ISO) in recent issues of *ISO Bulletin*:

April 1993 issue of *ISO Bulletin*

TC 28	**Petroleum products and lubricants**
ISO 3675:1993	Crude petroleum and liquid petroleum products – Laboratory determination of density or relative density – Hydrometer method
ISO 10574:1993	Refrigerated light-hydrocarbon fluids – Measurement of liquid levels in tanks containing liquified gases – Float type level gauges
TC 34	**Agricultural food products**
ISO 8586-1:1993	Sensory analysis – General guidance for the selection, training and monitoring of assessors – Part 1: Selected assessors
TC 35	**Paints and varnishes**
ISO 2431:1993	Paints and varnishes – Determination of flow time by use of flow cups
ISO 2812-1:1993	Paints and varnishes – Determination of resistance to liquids – Part 1: General methods
ISO 2812-2:1993	Paints and varnishes – Determination of resistance to liquids – Part 2: Water immersion method
TC 42	**Photography**
ISO 10602:1993	Photography – Processed silver-gelatin type black-and-white film – Specifications for stability
ISO 10977:1993	Photography – Processed photographic colour films and paper prints – Methods for measuring image stability
TC 46	**Information and documentation**
ISO 10161-1:1993	Information and documentation – Open Systems Interconnection – Interlibrary Loan Application Protocol Specification – Part 1: Protocol specification
TC 61	**Plastics**
ISO 9665:1993	Adhesives – Animal glues – Methods for sampling and testing
TC 121	**Anaesthetic and respiratory equipment**
ISO 5360:1993	Anaesthetic vaporizers – Agent-specific filling systems
ISO 9918:1993	Capnometers for use with humans – Requirements
TC 146	**Air quality**
ISO 9835:1993	Ambient air – Determination of a black smoke index
TC 147	**Water quality**
ISO 5667-8:1993	Water quality – Sampling – Part 8: Guidance on the sampling of wet deposition
ISO 5667-11:1993	Water quality – Sampling – Part 11: Guidance on sampling of groundwaters
TC 154	**Documents and data elements in administration, commerce and industry**
ISO 11180:1993	Postal addressing
TC 175	**Fluorspar**
ISO 3703:1993	Acid-grade and ceramic-grade fluorspar – Determination of flotation agents

May 1993 issue of *ISO Bulletin*

TC 34	**Agricultural food products**
ISO 882-1:1993	Cardamom (*Elettaria cardamomum* (Linnaeus) Maton var. *minuscula* Burkill) – Specification – Part 1: Whole capsules
ISO 882-2:1993	Cardamom (*Elettaria cardamomum* (Linnaeus) Maton var. *minuscula* Burkill) – Specification – Part 2: Seeds
TC 35	**Paints and varnishes**
ISO 6272:1993	Paints and varnishes – Falling-weight test
ISO 8502-4:1993	Preparation of steel substrates before application of paint and related products – Tests for the assessment of surface cleanliness – Part 4: Guidance on the estimation of the probability of condensation prior to paint application
TC 61	**Plastics**
ISO 182-3:1993	Plastics – Determination of the tendency of compounds and products based on vinyl chloride homopolymers and copolymers to evolve hydrogen chloride and any other acidic products at elevated temperatures – Part 3: Conductometric method
ISO 182-4:1993	Plastics – Determination of the tendency of compounds and products based on vinyl chloride homopolymers and copolymers to evolve hydrogen chloride and any other acidic products at elevated temperatures – Part 4: Potentiometric method
ISO/TR 9372:1993	Plastics – Basic materials for polyurethanes – Determination of the amounts of 2,4- and 2,6 isomers in toluenediisocyanate by infrared spectroscopy
TC 87	**Cork**
ISO 2385:1993	Corkwood in planks, virgin cork, cleanings, cork pieces, corkwood refuse and corkwaste – Sampling to determine moisture content
ISO 10718:1993	Cork stoppers – Determination of colony-forming units of yeasts, moulds and bacteria capable of growth in an alcoholic medium
TC 92	**Fire tests on building materials, components and structures**
ISO/TR 9122-5:1993	Toxicity testing of fire effluents – Part 5: Prediction of toxic effects of fire effluents
TC 107	**Metallic and other inorganic coatings**
ISO 10546:1993	Chemical conversion coatings – Rinsed and non-rinsed chromate conversion coatings on aluminium and aluminium alloys
TC 114	**Horology**
ISO 3160-3:1993	Watch cases and accessories – Gold alloy coverings – Part 3: Abrasion resistance tests of a type of coating on standard gauges
TC 126	**Tobacco and tobacco products**
ISO 9512:1993	Cigarettes – Determination of ventilation – Definitions and measurement principles
TC 164	**Mechanical testing of metals**
ISO 4545:1993	Metallic materials – Hardness test – Knoop test
ISO 4546:1993	Metallic materials – Hardness test – Verification of Knoop hardness testing machines
TC 175	**Fluorspar**
ISO 5438:1993	Acid-grade and ceramic-grade fluorspar – Determination of silica content – Reduced-molybdosilicate spectrometric method
ISO 6676:1993	Acid-grade and ceramic-grade fluorspar – Determination of total phosphorus content – Reduced-molybdophosphate spectrometric method
ISO 9061:1993	Acid-grade and ceramic-grade fluorspar – Determination of iron content – 1,10-Phenanthroline spectrometric method
ISO 9438:1993	Metallurgical-grade fluorspar – Determination of total phosphorus content – Reduced-molybdophosphate spectrometric method
ISO 9502:1993	Metallurgical-grade fluorspar – Determination of silica content – Reduced-molybdosilicate spectrometric method
ISO 9504:1993	Metallurgical-grade fluorspar – Determination of antimony content – Solvent extraction atomic absorption spectrometric method
ISO 9779:1993	Metallurgical-grade fluorspar – Determination of lead content – Solvent extraction atomic absorption spectrometric method

Cleaner production worldwide

The term cleaner production was coined by the United Nations Environment Programme Industry and Environment Programme Activity Centre (UNEP IE/PAC) when it launched its Cleaner Production Programme in 1989. This programme was launched in response to a decision from the UNEP Governing Council to reduce global pollution and waste. The objectives of the programme are to:

- Increase worldwide awareness of the cleaner production concept;
- Help governments and industry develop cleaner production programmes;
- Foster the adoption of cleaner production throughout society;
- Facilitate the transfer of cleaner production technologies.

To meet these objectives, the programme focuses on training and the collection and dissemination of information on cleaner production that: explains the concept; illustrates technical applications; and helps people develop cleaner production programmes. These efforts, initiated through a number of different activities, have cultivated an ever expanding informal network of cleaner production experts, both in industry and government agencies.

UNEP IE/PAC has now published an attractive booklet entitled *Cleaner production worldwide*. This booklet, which was produced for UNEP IE/PAC by the UK Department of the Environment, originated from an idea suggested by participants at the UNEP IE/PAC Workshop on Country Specific Activities to Promote Cleaner Production, held in Paris in September 1991.

The booklet aims to show through examples that, by applying cleaner production, industry and consumers anywhere in the world can gain environmental benefits while reducing costs. The following are its contents:

- *Singapore*: Gas phase heat treatment of metals
- *Greece*: Chrome recovery and recycling in the leather industry
- *Denmark*: Minimised environmental effects in cotton production
- *Indonesia*: Pollution and waste reduction by improved process control
- *Netherlands*: Recovery of protein from potato starch effluent
- *France*: New technology – galvanising of steel
- *This booklet*: De-inking process for waste paper
- *India*: Reduction of sulphide in effluent from sulphur black dyeing
- *Poland*: Waste reduction in electroplating
- *Poland*: Waste reduction in steelwork painting
- *UK*: New product: water-based adhesives
- *Austria*: Cleaner production in a city-based project
- *Sweden*: Minimisation of organic solvents in degreasing and painting
- *USA*: Recovery of copper from printed circuit-board etchant
- *Information*

A variety of information and advice on cleaner production is available from: United Nations Environment Programme Industry and Environment Programme Activity Centre, Tour Mirabeau, 39–43 quai André Citröen, 75739 Paris Cedex 15, France. Tel.: +33 (1) 40 58 88 50. Fax: +33 (1) 40 58 88 74. Telex: 204 997F. Cables: UNITERRA PARIS.

The IE/PAC dates back to 1975. The office was created by UNEP to bring together industry and governments to work in cooperation towards environmentally sound development.

News & Views

Environmental impact of tourism

The tourism industry serves over 450 million people travelling internationally, and 10 times as many travelling domestically. It covers such diverse activities as transport, accommodation, entertainment and catering among many others. With more than 130 million employees, and an annual investment in capital projects of more than USD 400 billion, it ranks alongside such sectors as construction and petrochemicals as a major world industry.

The potential environmental impacts of tourism activities are numerous and varied. Too many visitors at a given place, season or time can, for example, cause erosion or disturb wildlife, which can be especially sensitive at nesting and breeding times. Providing for and managing tourism often places a considerable burden on natural resources. For example, in the Caribbean, tourist demand for seafood is considered the prime cause of the increasing pressure on lobster and conch populations. International tourism often generates considerable trade in endangered species. Tourism development puts pressure on all local resources: tourists consume energy and water for example. Tourist infrastructure, lodging and transport facilities often damage landscape and nature. In the Mediterranean basin, for instance, tourist demand has led to the rapid and often disorderly urbanization of large stretches of the French, Spanish and Italian coasts.

Another important environmental impact is the pollution generated by tourism activities. Tourists produce sewage and solid waste. They often leave litter. Planes, buses and cars make noise and pollute the air. For local people, tourism also means disturbance to ways of life and social structures, and increased costs to build and maintain facilities, such as sewage treatment plants or roads, to cater for peak numbers of tourists.

The rise of 'ecotourism' indicates that an increasing number of tourists now prefer to visit attractive natural environments instead of going on traditional city- or beach-based holidays. However, without careful management, it will not stop tourism's current environmental impacts – it will create new ones. It can lead to development, destruction and pollution in some of the world's most ecologically fragile areas.

The key question is: how can the goals of tourism development and environmental protection be reconciled? Putting tourism on a sustainable development path is a big challenge.

These are some of the points made and questions raised in the article 'Sustainable tourism development' which introduces the July–December 1992 issue (Vol. 15 No. 3–4) of *Industry and Environment* – a publication of the United Nations Environment Programme Industry and Environment Programme Activity Centre – UNEP IE/PAC. Other articles in this issue include:

- Tourism and the environment: facts and figures.
- Development of tourism in the Himalayan environment: the problem of sustainability (Tej Vir Singh).
- The ecological environment of Mt Huangshan Scenic Area and its protection strategy (Pan Tiansheng).
- Sustainable tourism development in the Maldives and Bhutan (Edward Inskeep).
- Environmental impacts of tourism on the Kenya coast (Nico Visser and Steven Njuguna).
- Wastewater and solid waste management in the national parks of the Canadian Parks Service Western Region (R. M. Martinson).
- Tourism and the environment: the role of the European Community (Georges Tzoanos).
- Tourism and the environment: maintaining the balance in England (Michèle Grant)
- Tourisme et environnement – l'expérience française (Jean Lafont et Claudine Zysberg)
- Eco-tourism: the future for the Caribbean? (Alain Vialleton)

How can the goals of tourism development and environment protection be reconciled?

Conference on the role of science in rebuilding Central and Eastern Europe

CONFERENCE STATEMENT

The International Council of Scientific Unions (ICSU) with UNESCO and the Commission of European Communities convened a Conference on the Role of Science in Rebuilding Central and Eastern Europe at Leeds Castle, Kent, UK, in April 1993. The 2-day Conference was attended by 33 persons from 15 countries and 6 international organizations, including a number of leading international scientists, ministers, parliamentarians and officials responsible for policy-making. The purpose of the Conference was to draw high level attention to the serious problems facing science in Central and Eastern Europe (not on this occasion including the countries in the Former Soviet Union) and to explore strategies for solutions.

After extensive discussion, participants were unanimous in stressing the important role of science and technology both in achieving economic progress and prosperity, and as part of a nation's cultural heritage. It was emphasized that it is essential to include science in national policies, utilizing existing talents and involving a full range of partners, including industry, academic and professional bodies. Science should have a central place in educational curricula from the earliest level and university science teaching must be combined with strong research activity.

It was recognized that priority-setting among different needs of society entails difficult decisions, especially at a time of economic restructuring and financial stringency; nevertheless it is vital that governments make adequate provision to safeguard science since it is very difficult to re-establish the necessary human capital and infrastructure once these have been dissipated. Scientists must constantly seek to influence decision-makers and the public using all available channels. As regards the balance between basic research and its application in a market-setting, it was recognized that both must be supported and that increased interaction between scientists and industry is imperative if the full benefits are to be realized for society. Recommendations of a more specific nature included:

- establishment of a clearing-house or a network to provide information on existing international opportunities to assist science and scientists in Central and Eastern Europe;
- setting up of a programme of chairs and exchange programmes to strengthen university teaching and research;
- support to outstanding individuals to allow them to pursue their teaching and research;
- increased provision of training and educational opportunities for young scientists in their own countries and abroad;
- expanding existing programmes and strategies to secure academic and professional equivalence at a regional and international level;
- introduction of financial and material incentives to discourage brain drain;
- support of increased research on technology transfer between East and West and between basic research and industry;
- undertaking independent assessments of science and technology capacity and potential in the countries of Central and Eastern Europe and disseminating the results widely;
- development of appropriate legislation in Central and Eastern European countries to meet changing conditions in science and technology, including questions of intellectual property rights, patents, and fiscal matters;
- expansion of cooperation through innovative groupings and partnerships of all kinds (e.g. joint ventures, research, networking, etc.) on a regional or multilateral basis, involving appropriate professional bodies and international organizations;
- convening periodic meetings of the type held in Leeds Castle to assess needs for the development of science.

Finally, participants requested the three organizers of the meeting, ICSU, UNESCO and the Commission of European Communities, to follow up all these recommendations by concrete action wherever possible.

The IUPAC-sponsored ICOS-92 was held in Montréal.

ICOS donation

The 9th International Conference on Organic Synthesis (ICOS/CISO '92) has donated the sum of CAD 3000 to IUPAC's Division of Organic Chemistry. This donation, which was made by the ICOS-92 Organizing Committee from excess funds, was provided in order to help fund the work of the Subcommittee on Organic Synthesis. IUPAC President Allen Bard has written, on behalf of IUPAC, to ICOS-92 Chairman Robert Young thanking him and the Organizing Committee for this donation and their efforts in organizing the Conference. In particular, Bard expressed his appreciation of the events surrounding the first award of the new Thieme–IUPAC Prize in Synthetic Organic Chemistry that took place at the Conference.

ICOS-92 was held in Montréal, Canada on 28 June – 2 July 1992. Two reports on the conference were published in *Chem. Intl.* [**15**, 11–13 and 59–60 (1993)]. Plenary and invited lectures presented at the Conference were published in the December 1992 issue of *Pure Appl. Chem.*

Large international conferences can influence young chemists and their future careers.

In praise of large conferences

The first scientific conference that I ever attended was the IUPAC Symposium on The Chemistry of Natural Products held in Melbourne, Canberra and Sydney over two weeks in August 1960. It attracted some 500 chemists, including some of the all times greats of chemistry to Australia – like Barton, Djerassi, Robinson, Todd and Woodward. As a young and naive MSc student at The University of Sydney at the time, I probably thought that all scientific conferences would be more or less like this meeting. In actual fact it was a truly exceptional conference. It was the inaugural IUPAC Symposium on Natural Products and was a landmark event for Australian chemistry. It took advantage of Australia's pioneering work in natural products chemistry and won many friends for Australian chemistry in the world at large. Being held in 3 cities was quite an innovation that added to the camaraderie that I now know to be such an important ingredient of conferences, and broke down some of the territorial barriers between a single host city and the visitors. The conference organization itself brought many Australian chemists together in a common cause – and as with other international conferences in Australia, the conference topic was widely interpreted such that most Australian chemists could participate if they so wished.

I was especially fortunate that this IUPAC Symposium gave me the opportunity to meet many of the world's leading chemists; my next door neighbour in Sydney happened to be Claude Nicholls, then RACI President and Vice President of the IUPAC Symposium. I was able to meet the President of the IUPAC Symposium, Sir Alexander Todd, and was so impressed by his opening address in the Wilson Hall at The University of Melbourne that I decided that I wanted to do my PhD. with him! Clearly, this IUPAC Symposium had a substantial effect on my career. Looking through the symposium literature recently reinforced my memories of a conference both scientifically and socially glittering. The Symposium Banquet (cost AUD 3.00) was held at the grand old Hotel Canberra and featured good Australian food (oysters, sole, beef, and papaw dressed up with French names) and wine (Mildara Supreme Sherry, Tintara Eden Moselle 1958, Tulloch's Pokolbin Dry Red Hermitage 1957, and Mildara Pot Still Brandy). This banquet gave me the opportunity to meet the President of the Australian Academy of Science, Sir John Eccles – I was to join Eccles' department at ANU in 1965 and to work at the John Curtin School for a further 15 years!

All this demonstrates some of the positive aspects of large conferences. I have been to a lot of conferences over the intervening years – I went to the second IUPAC Symposium on the Chemistry of Natural Products in Prague in 1963 and to the 10th in Dunedin in 1976. A highlight of the latter was Fred Sanger's lecture on his newly developed procedure for DNA sequencing for which he was to receive his second Nobel Prize. In more recent years I have become very involved in organizing international meetings, including two very successful international meetings in Sydney, the pharmacology meeting in 1987 which attracted more than 3000 delegates and the rather smaller neurochemistry meeting in 1991 (800 delegates). But now I am involved in a really large meeting – PACIFICHEM '95. The 1989 meeting of the chemistry societies from countries bordering the Pacific Ocean attracted over 7000 people and we are expecting something like 12 000 for the 1995 meeting. We are organizing lecture room facilities for 49 concurrent sessions. Fortunately the American Chemical Society conference staff are experts at providing for such large meetings – though they have the complication of having to accommodate the best intentions of the other host societies, the Canadian Society for Chemistry, the Chemical Society of Japan, the Royal Australian Chemical Institute and the New Zealand Institute of Chemistry. International meetings are inherently more complicated than national meetings, cultural, economic and scientific diversities being what they are.

Graham Johnston
President, The Royal Australian Chemical Institute (RACI)

[This item was part of the 'President's Column' published in Chemistry in Australia*, p. 105, March 1993.]*

Metal complex stability constants database

Solution chemists have been well served by several book compilations of stability constants. Earlier volumes were published by the The Chemical Society (London), the last two, *Inorganic Ligands*, compiled by E. Hogfeldt, and *Organic Ligands*, compiled by D. D. Perrin, being published in 1982 by Pergamon (IUPAC Chemical Data Series Nos 21 and 22). These completed coverage of the literature up to about 1974.

Since 1982, the IUPAC Commission on Equilibrium Data (Commision V.6) has been concerned to extend the literature coverage effected by these invaluable compilations of stability constants. It was determined that the next compilation should be computer-based, since computer searching has significant advantages over book-based indexes.

An international team of abstractors is extracting literature data for Commission V.6 under its Stability Constants Subcommittee. The resultant compilation, to be called the IUPAC Stability Constant Database (SC-database) will complete literature coverage to the end of 1989. The first phase of the project, with data entry partly supported by the IUPAC Committee on Chemical Databases (CCDB), is to be released at the IUPAC General Assembly in Lisbon in August 1993. In the second phase, data from the existing book compilations will be transferred to SC-database, supported financially by the Royal Society of Chemistry (London) to give a complete, comprehensive database which will be regularly maintained and upgraded as more stability constant data are published. It will also feature critcial evaluations of constants and other enhancements as required.

Implementation

A significant step in the evolution of SC-database has been the commitment of Academic Software to develop software packages for assembling, editing and interrogating the databse on a PC. The initial release of SC-database will contain records for over 5000 ligands and about 25 000 experiments (totalling about 75 000 equilibria) published between 1974 and 1989. Subsequent releases will extend coverage up to 1974, and beyond 1989.

Leslie Pettit

Kip Powell

SC-database software is designed and written for the IBM PC and compatibles in compiled CLIPPER™ code; hence no additional software is needed. It can be controlled using a mouse and searching is simple and user-friendly. Distinctive features of SC-database software are its power, flexibility and speed in accessing stability constant data. When specifiying a search profile, the user can select any combination of ligand name, empirical formula, ligand class, metal ion, experimental conditions (temperature, ionic medium, etc), journal or author. Names can be specified in full or by *any* fragment and users can store their own profiles or generate self-containing database subsets.

In addition to search and display routines, SC-database software includes speciation calculations based on stability constants selected from the database by the user, also structure diagrams for selected ligands. Output from SC-database can be directed to screen (with either one or several metal-ligand combinations per screen) or to disk or printer.

On-screen help is available for all aspects of using the database and for search protocols. The comprehensive manual includes tutorials on profile specification, showing how to exploit the full power of SC-database. It also includes explanatory notes on solution equilibria for users who are inexperienced in accessing the literature on stability constants, and a bibliography on measurement and interpretation of stability constants.

SC-database will be an essential companion for every solution chemist and a powerful resource for chemists involved in analysis, soil chemistry, oceanography, biological chemistry, environmental science, pharmaceutical science, industrial chemistry and in academic research.

Distribution and marketing of SC-database will be by Academic Software with initial release in August 1993. For further information, order form and/or demonstration disk, call or write to: Academic Software, Sourby Data Centre, Timble, Otley, Yorks, LS21 2PW., UK. Tel: +44 (943) 880628. Compuserve 100015,3027. E-mail: chm6ldp@uk.ac.leeds.sun.

L. D. Pettit and H. K. J. Powell

Names and Addresses

Full details (names, addresses, telephone/telex/fax numbers) of commission and committee chairmen and secretaries and IUPAC officers were published in *Chem. Intl.* **13**, 223–233 (1991). The IUPAC Secretariat has been notified recently of the following changes:

Dr J. Lawrence FOX (Chairman, Commission on Biotechnology). POB 3011 M.C. F-2, Amoco Technology Company, Naperville, Illinois 60566-3011, USA.

Prof. Kozo KUCHITSU (Vice-President, Physical Chemistry Division). Department of Chemistry, Faculty of Science, Keyakidai, Sakado, Sitama 350-02, Japan. Tel.: +81 (492) 71 7987/+81 (492) 86 2233 Ext. 214. Fax: +81 (492) 71 7985.

Prof. John WARD (Treasurer), 'Spennymoor', 126B, The Street, Poringland, Norwich NR14 7LA. Tel.: +44 (508) 494047. Fax: +44 (508) 493647.

SCOPE Programme 1993–95

The *SCOPE Programme & Directory 1993–1995* has been published recently. SCOPE is the Scientific Committee on Problems of the Environment of the International Council of Scientific Unions (ICSU). Its President is John Stewart (Canada). Valentin Koptyug (Russia), who was President of IUPAC from 1987 to 1989, is SCOPE Vice-President.

The booklet contains details of the SCOPE approach, some of its achievements, its reports and a description of its programme. This is divided into five clusters which, though complementary, have, inevitably, varying degrees of overlap. The five clusters are:

Sustainability – which covers a broad, new subject area overlapping widely with all the other clusters and including major interdisciplinary effects towards the utilization of ecological and socio-economic knowledge to identify options to ensure the sustainability of the biosphere;

Biogeochemical cycles – which concentrates on essential elements and toxic substances, including radionuclides;

Global changes – which assesses the effects of various types of systemic or cumulative global environmental changes. This includes liaison with IGBP (the International Geosphere–Biosphere Programme) which implements research programmes in this area;

Ecosystems and biodiversity – which focuses on ecosystem processes as affected by environmental change, and on losses in biological diversity, especially in relation to ecosystem function;

Health and ecotoxicology – which develops methodologies for assessing chemical risk to human and non-human targets, and case studies of environmental contamination.

The directory section of the booklet also gives a list of SCOPE members and committee contact persons and other useful information.

For further information please contact: Scientific Committee on Problems of the Environment – SCOPE, 51, boulevard de Montmorency, 75016 Paris, France. Tel.: +33 (1) 45 25 04 98. Telex 645554 F ICSU. Fax: +33 (1) 42 88 14 66. E.mail: scope@paris7.jussieu.fr internet.

ISO 9000 Forum

The *ISO 9000 Forum* provides access for users and potential users of ISO 9000 standards to information from experts and problem-solvers. By subscribing to the *Forum*, members are entitled to a range of services, including the following:

- *ISO 9000 News*, a newsletter on quality management standards, published six times a year;
- Discounts on new and revised editions of the ISO 9000 series;
- Reviews of topical books and articles on quality management and quality assurance;
- Listings of third-party registrars of quality systems, and of auditor accreditation bodies;
- Information on sources of training materials; and
- The opportunity to attend *ISO 9000 Forum* Application Symposia at a reduced charge.

The *Forum* is intended to answer the numerous requests from companies on how they can qualify for ISO 9000 status. The aim is to put the answers to the basic questions into one package so that businesses can find what they need to know about the ISO 9000 standards as quickly and inexpensively as possible.

One of the most important tools at the disposal of the *Forum* is its newsletter. *ISO 9000 news* is a regular source of information on the multiple and multi-faceted developments in the field of quality. Coverage of ISO -9000-related issues is both comprehensive and international in its scope.

It has included detailed interviews with some of the major contributors in the quality arena, such as Reg Shaughnessy and Peter Ford, respectively Chairman and Secretary of the ISO Technical Committee 176 which developed the ISO 9000 series. Jacques Repussard, Secretary-General of the European Committee for Standardization (CEN), has, in turn, answered questions on the application of ISO 9000 within the context of the European Community.

ISO

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies from some 90 countries. The objective is to promote the development of standardization and related activities throughout the world, with a view to facilitating the international exchange of goods and services, and to developing cooperation in the spheres of intellectual, scientific, technological and economic activity.

For further information please contact: Anke Varcin and Roger Frost, Promotion and Press Services, ISO Central Secretariat, 1, rue de Varembé, Case postale 56, CH-1211 Genève 20, Switzerland. Tel.: +41 (22) 749 01 11. Fax: +41 (22) 733 34 30.

International developments

Being published by the ISO Central Secretariat, *ISO 9000 News* has close links with national member bodies of ISO's worldwide network and can thus provide readers with a direct line to new international developments, such as the efforts by the ISO Council Committee on conformity assessment to promote mutual recognition of ISO 9000 certificates.

The international perspective is provided by such services as a table giving *ISO 9000 News* readers a quick reference to ISO 9000 identical, or equivalent, standards throughout the world.

Reports of recent *ISO 9000 Forum* symposia in Paris, Tokyo, Brussells, Brisbane and Mexico City have indicated the current preoccupations of quality professionals, and the experience of ISO 9000 implementation in different coun-

tries and cultures. In-depth articles on ISO 9000 developments within ASEAN and in South America have helped fill in the global picture. A regular feature, "Country focus", has already put the spotlight on the progress of ISO 9000 in Mexico, Israel, Spain, Italy and Germany.

Guest contributors are encouraged to highlight specific issues. This has led, for example, to an examination of the reluctance of some companies in the United States who fear ISO 9000 as a barrier to prevent them trading with the European Community. US perceptions, however, are changing in a positive direction and articles in *ISO 9000 News* have helped explain why.

The concerns of developing countries that ISO 9000 certificates issued by local auditors will not be recognized internationally have also been featured. Airing controversial views and reporting negative experiences is part of the mission of the *ISO 9000 Forum* because it is intended to encourage an environment for debate.

In recognition of the learning needs of many readers, particular attention is given to reporting on training material that becomes available, as well as special features casting light on particular issues, such as Memoranda of Understanding (MoUs) between quality system registrars.

One of the *Forum* services is that subscribers receive free, or at reduced rates, publications dealing with quality management and quality assurance. Publications of the *ISO 9000 Forum* Library include a list of relevant ISO-IEC (International Electrotechnical Commission) guides and associated documents, and a worldwide directory of national third-party registration bodies, of which the second edition will soon be available.

ISO 9000 News regularly reviews new books, such as the ISO/IEC publication, *Certification and related activities: Assessment and verification of conformity to standards and technical specifications,* which will prove to be a useful reference source for suppliers in industry, legislators and government officials concerned with trade and consumer affairs, the personnel belonging to the statutory authorities or commercial organizations who carry out assessment and verification programmes, operators of testing laboratories, and the purchaser/end-users themselves of products and services.

Lastly, *Forum* members receive free of charge the monthly *ISO Bulletin,* which keeps them updated on developments in international standardization in general.

Two-way flow

The flow of information is intended to be two-way. The columns of *ISO 9000 News* are also open to those who wish to comment on, query and debate any of the issues so far dealt with – or those which they think should be. The *ISO 9000 Forum* aims to facilitate communications between newcomers to quality standardization and those who, having already trod the path, have experience to draw on an advice to share. Regular news on ISO 9000 implementation in companies and organization in sectors as varied as those of land mobile radio communications and the leisure industry contributes to this aim.

ISO Memento and Catalogue

The 1993 edition of the *ISO Memento* and the *ISO Catalogue* have been published.

The *Memento* gives full details of the scope of responsibility, organizational structure and secretariats of each of the organizations's 2709 technical bodies. In addition, the *Memento* contains general information on the organization and administration of the work of ISO.

The *Catalogue* is more than a mere list of the existing 8651 ISO International Standards: its specially designed structure provides a tool enabling quick and direct access to all standards and normative documents published by ISO.

The Memento *is priced at CHF 41.– and the* Catalogue *at CHF 53.–. They can be ordered directly from the International Organization for Standardization: ISO Central Secretariat, Case postale 56, CH-1211 Genève 20, Switzerland.*

Author deadlines for *CI* 1994

The following are the deadlines for receipt of items at the IUPAC Secretariat in Oxford for publication in 1994 issues of *Chemistry International* (*CI*). Authors of feature articles and other lengthy items should submit their contributions well in advance of these dates. Since *CI* is a news magazine it is not possible to guarantee publication of any item in a particular issue. In many cases it is necessary to postpone publication of material to a later issue.

Please note that the International Organization for Standardization (ISO) agreed format for writing dates is used as follows: year–month–day.

CI *Vol. 16, 1994 issue*	*Deadline for receipt of material*
No. 1 (January)	93.10.08
No. 2 (March)	93.11.26
No. 3 (May)	94.02.05
No. 4 (July)	94.04.08
No. 5 (September)	94.06.10
No. 6 (November)	94.08.05

Authors submitting contributions to CI *are asked to refer to* 'Chemistry International*: guidelines for authors' (*Chem. Intl. ***14****, 232, 1992).*

We regret to record the deaths of

Prof. D. N. Kirk, UK (7 October 1992) – Assistant Scientific Editor, *Pure and Applied Chemistry* (1976–77).

Prof. A. L. Latner, UK (10 December 1992) – Commission on Clinical Chemistry (1965–67), Clinical Chemistry Section Committee (1967–75), Commission on Teaching in Clinical Chemistry (1967–79).

Prof. P. Yates, Canada (16 November 1992) – Organic Chemistry Division: Member (1967–71), Secretary (1973–75), Vice-President (1975–77), President (1977–79)

Capping capnometers

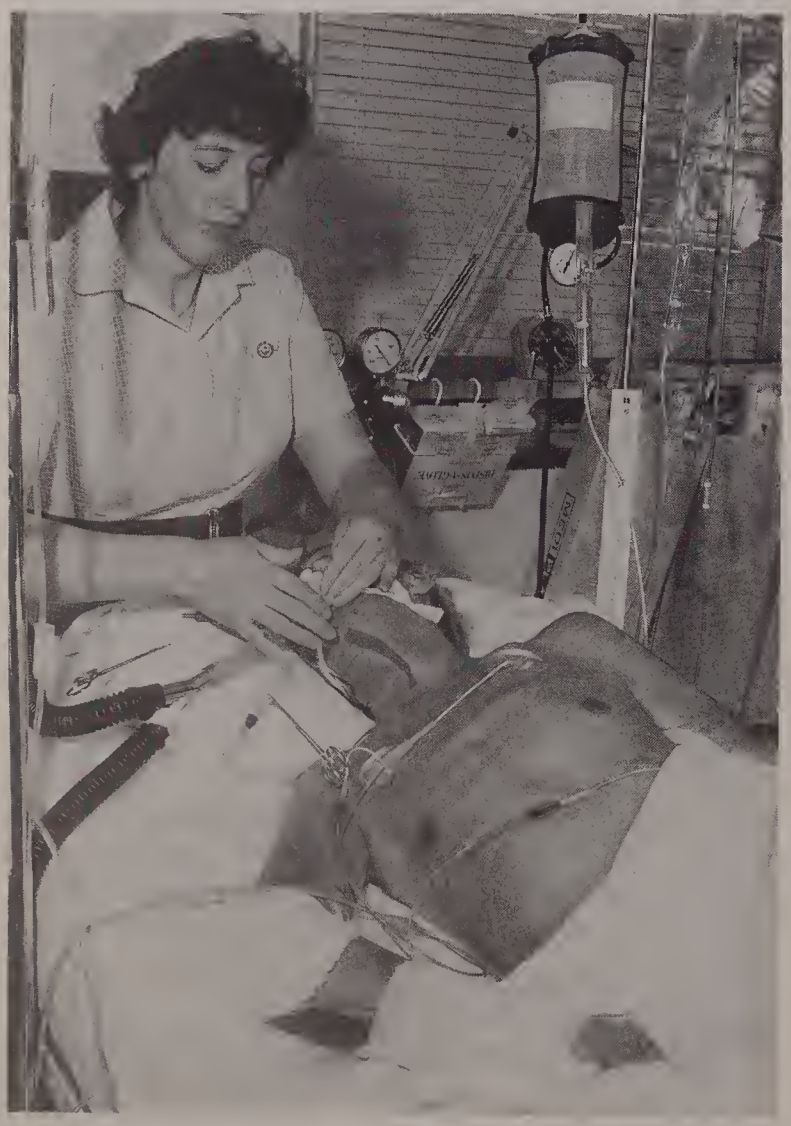
Measuring carbon dioxide concentration in respiratory gases

It's all round us. It's what we breathe out of our lungs every day. In photosynthesis, plants absorb it and water, which synthesize certain carbohydrates and release oxygen into the air. It neither burns nor does it support combustion. Colourless and odourless, carbon dioxide dissolves in water to form carbonic acid.

Carbon dioxide has useful applications in many fields: you find it in everything from fire extinguishers to carbonated drinks, but most particularly it is of great importance in the field of medicine. The measurement of carbon dioxide in a gaseous mixture has become a common practice in many areas of clinical medicine, such as anaesthesia, respiratory therapy and intensive care.

International Standard ISO 9918, *Capnometers for use with humans – Requirements,* specifies minimum safety requirements based on parameters that are achievable within the limits of existing technology. It was prepared by ISO/TC 121, *Anaesthetic and respiratory equipment,* Sub-Committee SC 3, *Lung ventilators and related equipment.*

The reasoning behind one of the important requirements developed in this International Standard can be summarized in the following way. A capnometer is not a life-support device, but a "vigilance-adjunct", and to make an instrument completely resistant to electrostatic discharges can be quite expensive. Although this is fully justified for life-support apparatus, it is not justified for capnometers if such devices do in fact fail without presenting erroneous patient data. It is necessary to limit application of such discharges to accessible parts, since to allow the application of discharges to the interior of the device would require the device to have internal barriers that would make servicing it more difficult and costly. It is reasonable to expect any person opening a device for maintenance to exercise both common sense and accepted work practices which include ESD (Electrostatic Discharge) precautions.



Measurement of carbon dioxide in a gaseous mixture has become a common practice in many areas of clinical medicine, such as anaesthesia, respiratory therapy and intensive care.

Accurate knowledge of inspired and exhaled carbon dioxide concentrations provides the clinician with vital patient safety information regarding the patient's cardiopulmonary status, the function of the airway, and the breathing system. Adjustments of pulmonary ventilation, blood volume, and systemic circulation are often based on value of exhaled carbon dioxide. Recognition of unintended oesophageal intubation, partial and complete airway obstruction, and re-breathing of exhaled carbon dioxide from the breathing system are often first recognized by changes in carbon dioxide concentrations. For clinicians to use capnometers routinely for enhancement of patient safety and management, there must be confidence in the reliability and accuracy of the displayed data from the capnometer. The accuracy specifications detailed in clause 50 of the International Standard are considered to be sufficient to meet these requirements.

Hence the importance for clinicians of the safety and reliability offered by this International Standard.

From *ISO Bulletin*, Vol. 24, No. 5, pp. 6–7, May 1993.

Chemical spell checker

A technical dictionary that saves hours of spell-checking has been developed for the chemical community. With SciWords (TM) you can virtually eliminate 'word not found' messages and be confident your scientific documents and manuscripts are correct. SciWords, a scientific and technical spell checker dictionary of over 75 000 organic and inorganic chemical names plus chemistry, physics and biology technical words for use with your word processor is now available. Special emphasis has been placed on pharmaceuticals, agrochemicals, pesticides and biochemical materials.

SciWords works with the major word processors (WordPerfect and Microsoft Word) and is easy to install and use. It integrates transparently with your word processor. SciWords for other word processors (including MacWrite, Wordstar, Ami-Pro, Framemaker) are now under development and should be available later this year.

SciWords costs USD 50.00 per copy. University and volume discounts are available. To order or for more information contact: Pool, Heller and Milne, Inc. 9520 Linden Avenue, Bethesda, MD 20814, USA. Tel.: +1 (301) 493 6595. Fax: +1 (301) 897 3487. E-mail: PHM@PINET.ALP.ORG.

Affiliate Affairs

New ISO brochure

The title of a new 20 page brochure produced by ISO Central Secretariat, *Compatible technology worldwide*, provides a comprehensive introduction to ISO's mission, organization and work.

The brochure answers the basic questions about the who, what, why, and how of international standardization and ISO's role. It will serve as a single-source document for responding to the enquiries of the public and press. It will also provide a basic understanding for those in business and industry who wish to participate in international standardization, or evaluate what such work can do for their activities.

Compatible technology worldwide *(ISBN-92-67-10181-1) may be obtained from the Central Secretariat of the International Organization for Standardization (ISO), 1, rue de Varembé, Case postale 56, CH-1211 Genève 20, Switzerland. Tel.: +44 (22) 749 01 11. Fax: +41 (22) 733 34 30. Telex: 41 22 05 iso ch. A French edition is also available.*

Address of IUPAC Secretariat

Please use the following address for all communications directed to the IUPAC Affiliate Affairs Secretary. If you are submitting a letter for publication in Chemistry *International* (*CI*), please indicate that the letter is 'Submitted for publication in *CI*.'

Affiliate Affairs Secretary
IUPAC Secretariat
Bank Court Chambers
2-3 Pound Way
Templars Square
Cowley
Oxford OX4 3YF
UK

Tel.: +44 (865) 747744
Fax: +44 (865) 747510
Telex: 83147 VIA OR G
attn. IUPAC
E-mail: IUPAC@VAX.OXFORD.AC.UK.

Information for Affiliates

How to contact commissions

IUPAC affiliates are entitled to communicate directly on scientific matters with the officers of IUPAC commissions. A full list of names and addresses of all commission officers for 1991–93 was published on pages 223–233 of the November 1991 issue of *CI*. Photocopies of this list are available upon request from the Affiliate Affairs Secretary.

Affiliate reduction of conference registration fees

It is a condition of IUPAC sponsorship of a conference that IUPAC affiliates are entitled to a 10% reduction or 'own members' rate on the registration fee for scientific participants. This concession is usually – but not always – announced in the conference circulars and indicated on the registration form.

To receive this reduction an affiliate must declare on the conference registration form that (s)he is an affiliate. Alternatively the affiliate should apply in writing to the conference organizer for this reduction stating that (s)he is an affiliate. Conference organizers may check with the IUPAC Secretariat that applicants for this reduction are currently registered as affiliates.

If an application for this reduction is refused, an affiliate should immediately notify the Affiliate Affairs Secretary and, if possible, forward copies of documentary evidence of this refusal

IUPAC publications

Affiliates are entitled to a 25% reduction and in some cases a 40% reduction on the cost of IUPAC publications except the scientific journal *Pure and Applied Chemistry*. A leaflet detailing IUPAC books currently available from Blackwell Scientific Publications has recently been distributed by the publishers to all *CI* readers. Further copies may be obtained from the IUPAC Secretariat.

IUPAC-sponsored conferences

If you are interested in attending a conference please apply directly to the conference organizers for the conference circulars and registration forms. An updated list of names and addresses of the organizers of all future IUPAC-sponsored conferences is given in the 'Conference Calendar' published in each issue of *CI*.

IUPAC poster

Copies of an IUPAC poster (see page 214 of the November 1990 issue of *CI*) are available **free of charge** to affiliates and members of IUPAC's commissions and committees. The poster is printed in maroon and black on a white background and is approximately 42 × 59 cm in size.

IUPAC welcomes any publicity you can give to its activities. If you would like to display one or more copies of the poster in your department or elsewhere please write to the Affiliate Affairs Secretary stating your name and address and how many copies of the poster you wish to receive.

Commission & Committee News

Destruction of chemical warfare agents

The IUPAC Task Force on Scientific Aspects of the Destruction of Chemical Warfare Agents held its first meeting at the Chemical and Biological Defence Establishment (CDBE), Porton Down, Salisbury, Wiltshire, UK, on 22–24 February 1993 (see *Chem. Intl.* 15, 121–122, 193). The following is the EXECUTIVE SUMMARY of the first meeting.

Members of the Task Force have been chosen for their expertise in the field of chemistry and/or the field of chemical weapons. At the outset, the Task Force affirmed its dedication to providing an independent scientific examination of the problems associated with the destruction of chemical weapons. The results of its work will be made freely available to all persons concerned with the destruction of these weapons: elected officials, government employees and citizens. The Task Force will facilitate access to relevant information, evaluate various aspects of the problem, and identify research still needed to enable the best possible choice of destruction technology to be made. The principal criteria which should be taken into account are: safety of operating personnel and of the general population, efficacy and economy.

Aspects of the general problem selected for principal attention are:

- Destruction technologies;
- Conversion of chemical warfare agents into products useful in civilian life;
- The chemical fate and environmental effects of agents and their degradation products, both naturally occurring and generated during destruction operations;
- Methods for the rapid detection and quantitative determination of agents at low concentrations, especially in gas streams; and
- The organization of an annotated bibliography of the science and technology of chemical warfare agent destruction.

Also, the Task Force will encourage further study on the possible toxic effects of chemical warfare agents arising from prolonged exposure at very low concentration levels, and on how best to ensure that citizens be kept informed of advantages and disadvantages of proposed destruction methods.

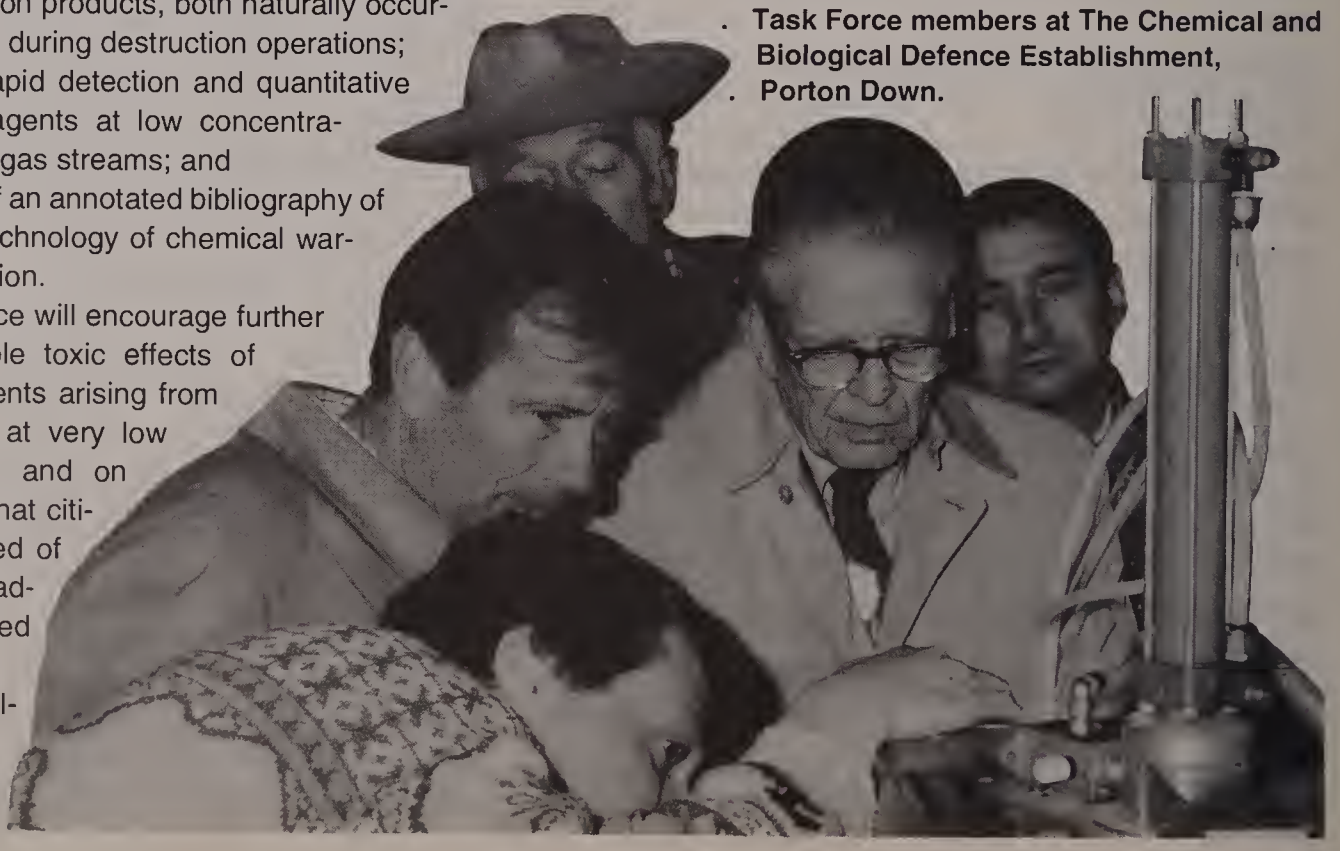
Subject to the availability of funding, the Task Force plans to conduct a "Workshop" on the chemistry of chemical warfare agents and destruction technologies sometime in 1993. Some 30 scientists and engineers, selected for their experience with destruction of chemical weapons or their leadership in fundamental research in relevant areas of chemistry, will be invited to the Workshop. Participants in the Workshop will be encouraged to present factual material, to suggest new approaches for destruction of agents, and to engage in critical discussion of suggested or planned approaches.

Following the Workshops, the Task Force will discuss the different approaches to the destruction of these weapons, critically and objectively, and present the results of its work according to the IUPAC procedures. It anticipates identification of problems requiring further attention through research, evaluation of the pros and cons of various destruction methods, and the provision of information to interested persons. The Task Force believes that the results of its work will be of benefit to many organizations, including officials of the proposed UN Organization for Prohibition of Chemical Weapons, which will have the task of overseeing the implementation of the new Chemical Weapons Convention.

Costs of this first meeting of the Task Force were covered in part by the host institution, the UK Chemical and Biological Defence Establishment, by the US Army European Research Office, by the John D. and Catherine T. MacArthur Foundation, by the national governments or employer institutions of some Task Force members, and from the personal resources of some members.

The meeting was co-chaired by Task Force Chairperson Joseph F. Bunnett of the University of California, Santa Cruz, and by Ron G. Manley of the CBDE in Porton Down, UK.

. Task Force members at The Chemical and Biological Defence Establishment, . Porton Down.



Conferences

Chemistry of natural products
Karachi, Pakistan
16–20 January 1994

The 19th IUPAC Symposium on the Chemistry of Natural Products: Chemistry, Nature and Mankind, will be held in Karachi and is being organized by H. E. J. Research Institute of Chemistry under the auspices of the Chemical Society of Pakistan.

The Symposium will cover the key aspects at the frontiers of natural product chemistry such as stereoselective synthesis, modern spectroscopic techniques for structure elucidation, bioactive natural products and bioorganic chemistry. The aim is to increase self-reliance in the developing Third World countries *via* effective utilization of their natural resources.

The scientific programme will consist of plenary lectures, session lectures and poster presentations. The session lectures will be divided into the following four parallel sessions:

A Synthetic approaches to natural products
B Bioactive natural products
C Structural studies on natural products
D Bioorganic chemistry.

The following scientists have agreed to deliver lectures:

Prof. Sir D. H. R. Barton (Nobel Laureate);
Prof. Herbert C. Brown (Nobel Laureate);
Prof. R. R. Ernst (Nobel Laureate);
Prof. R. Huber (Nobel Laureate);
Prof. D. J. Faulkner (USA);
Prof. Steven V. Ley (UK);
Prof. Kenji Mori (Japan);
Prof. R. Noyori (Japan);
Prof. B. M. Trost (USA);
Prof. P. Vollhardt (USA);
Prof. W. Voelter (Germany);
Prof. M. H. Zenk (Germany).

An exhibition of scientific instruments, books, computers and software is also planned. A pre-IUPAC symposium will be held in Colombo, Sri Lanka, on 12–15 January 1994. Interested persons should contact the Dean, Faculty of Science, University of Colombo, PO Box 1490, Colombo-3, Sri Lanka. A post-IUPAC symposium is planned to be held in Amman, Jordan, from 22–25 January 1994. Interested persons are requested to contact Prof. Salim S. Sabri, Dean, Faculty of Science, Department of Chemistry, University of Jordan, Amman, Jordan.

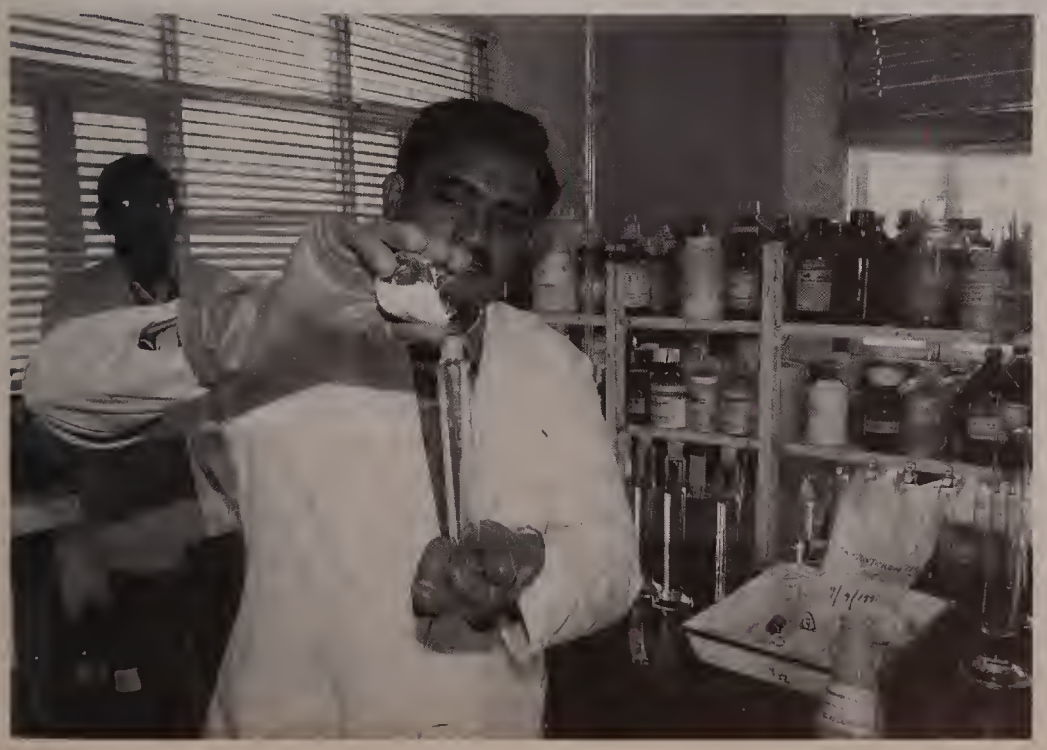
The advance registration fees are: delegates from private organizations USD 400; academics USD 300; students USD 75; accompanying persons USD 150. IUPAC affiliates will be given a 10% discount.

The official language of the symposium will be English.

A mixer, a reception, banquets and musical evening are planned. Shopping visits to various shopping centres of Metropolitan Karachi will be arranged. Post-symposium visits to various historical places in Pakistan will also be organized.

January in Karachi is normally pleasant and sunny with day temperatures in the range 15–25°C. Karachi has an international airport served by most major airlines, with connections to most destinations within Pakistan and abroad.

The city has a population of over 10 million and is the commercial and industrial capital of Pakistan. If offers a range of shopping attractions, which include hand-made woollen carpets, hand-crafted items of onyx, leather, sea shells, camel bone and metal. The Bazaar offers a variety of silks, brocades, velvets and cotton textile products. The cuisines ranging from Kabab to Tandoori lamb and fish marinated and spiced, served in a dozen ways offer novel exotic tastes to stimulate your taste-buds. For fun and recreation, sandy beaches like Hawkes Bay, Sandspit, and Paradise Point offer convenient and easy-to-reach resorts for picnickers. Besides being among the few green-turtle nesting grounds in the world, they are ideal for bathing, surfing and scuba diving. A number of ancient and historical sites are within driving distance from Karachi. They include archaeological sites from ancient history, the early Muslim era, and the Moghul period.



The Karachi Symposium aims to increase self-reliance in developing countries through effective use of their natural resources.

Polyblends '93

The Industrial Materials Institute of the National Research Council Canada will host its 12th symposium of the Polyblends series. Polyblends '93 will be held in the Institute, in Boucherville, on 26–27 October 1993.

The meeting will feature about 20 speakers gathered from industry, academia and government specializing in polymer blend research. Sessions on the following themes are being planned: **1** Compatibilization: Physical and chemical ways; **2** Rheology of blends and alloys; **3** Processing of blends and alloys; **4** Morphology development and control; **5** Performance of blends and alloys; **6** Blending technology applied to plastics recycling.

Further information: Mrs Colette Bussières Desmarais, 75 de Mortagne, Boucherville, Quebec, Canada J4B 6Y4, Tel.: +1 (514) 641-2280. Fax: +1 (514) 641 4627.

Pacific Polymer Conference

The 3rd Pacific Polymer Conference, organized by the Polymer Division of the Royal Australian Chemical Institute for the Pacific Polymer Federation (PPF), will be held at the Hotel Conrad Jupiters (Hilton) on the Gold Coast, near Brisbane, in South-East Queensland, Australia, on 13–17 December 1993. 42 International prominent polymer scientists from the member societies of PPF will give invited lectures at PPC-3 in a wide range of topics. Contributions from all areas of polymer chemistry, physics, materials, technology and engineering, including fundamental and applied aspects will be included in the programme.

The Pacific Polymer Federation was established in 1987 to advance polymer science and technology in the Pacific region. Membership of the Federation is open to all societies in, or near, the Pacific, which have activities in polymer science or technology. There are currently 10 member societies of the Federation. The Federation sponsors the biennial Pacific Polymer conferences, smaller regional meetings and publications *Progress in Pacific Polymer Science.*

Further information: PPC-3 Secretariat, Chemistry Department, The University of Queensland, Brisbane, QLD, 4072. Australia. Tel.: +61 (7) 365 3511. Fax: +61 (7) 365 3628. E-mail odonnell @chem. chemistry. uq.oz.au.

Postponement of Chemistry of the Amazon Symposium

The 1st International Symposium on Chemistry of the Amazon has been postponed from 19-23 September 1993 to 21 to 25 November 1993. The symposium, organized by the Brazilian Chemical Association, will be held in Manaus, Am, Brazil. Details were published in *Chem. Intl.* **15**, 92 (1993)

Further information from: Dr Peter Rudilf Seidl, International Symposium on Chemistrty of the Amazon, Associação Brasiliera de Química, Rua Alcindo Guanabara, 24/16° andar, 20031-130, Rio de Janeiro, RJ, Brazil. Tel. +55 (21) 262-1837. Fax +55 (21) 262-6044.

Hyphenated techniques in chromatography

The 3rd International Symposium on Hyphenated Techniques in Chromatography (HTC 3) will take place at the University of Antwerp, Belgium, on 23–25 February 1994. The symposium will cover all fundamental aspects, instrumental developments and applications of various hyphenated chromatographic techniques, for example, GC-MS, GC-FTIR, LC-NMR and SFE-LC.

Further information: Dr R. Smits,. p/a BASF Antwerpen N.V., Central Laboratory, Haven 725, Scheldelaan 600, B-2040 Antwerp, Belgium. Tel.: +32 (3) 561 28 31. Fax: +32 (3) 561 32 50.

Conference Calendar

Conference circulars and registrations forms for the IUPAC-sponsored conferences listed below may be obtained, upon request, from the names and addresses shown in italics.

Macromolecule–metal complexes

30 August – 3 September
5th International Symposium on Macromolecule–Metal Complexes. Bremen, Germany.
Prof. D. Wöhrle, Institute of Organic & Macromolecular Chemistry, University of Bremen, Leobener Str. NW 11, W-2800 Bremen 33, FRG.

Euroanalysis VIII

5–11 September
Euroanalysis VIII – European Conference on Analytical Chemistry. Edinburgh, UK.
P. E. Hutchinson, Analytical Division, Royal Society of Chemistry, Burlington House, Piccadilly, London W1V OBN, UK. Tel.: +44 (71) 4378 656. Fax: +44 (71) 7341227. Telex: 268001.

Advanced polymer materials

6–9 September
International Conference on Advanced Polymer Materials. Dresden, Germany.
Technische Universität Dresden, Dezernat 5, Kongress Service, APM'93, Mommsenstraße 13, 0-8027 Dresden, Germany.

Organometallic chemistry

19–23 September
7th International Symposium on Organometallic Chemistry Directed Towards Organic Synthesis (OMCOS-7).
Kobe, Japan.
Prof. Shun-Ichi Murahashi, Department of Chemistry, Faculty of Engineering Science, Osaka University, Toyonaka, Osaka 560, Japan. Tel.: +81 (6) 8436118. Fax: +81 (6) 8436118.

1994

Natural products chemistry

16–20 January
19th International Symposium on Natural Products Chemistry.
Karachi, Pakistan.
Prof. Atta-ur-Rahman, Chairman, Organizing Committee, H.E.J. Research Institute of Chemistry, University of Karachi, Karachi-75270, Pakistan.
Tel.: +92 (21) 470007 or 476131.
Fax: +92 (21) 467887 or 466896.
Telex: 28095 HEJRI PK. E-Mail: atta%hejfirst@unet.uu.net.

High temperature materials chemistry

4–9 April
8th High Temperature Materials Conference (HTMC VIII).
Vienna, Austria.
HTMC VIII, Gesellschaft Osterreichischer Chemiker, Nibelungengasse 11/6, A-1010 Wien, Austria.

Pesticide chemistry

4–9 July
8th International Congress of Pesticide Chemistry.
Washington, DC, USA.
Dr J. R. Plimmer, ABC Laboratories, 7200 ABC Lane, PO Box 1097, Columbia, MO 65205, USA.

Macromolecules

11–15 July
35th International Symposium on Macromolecules. Ohio, USA.
Macroakron'94, Cathy Manus-Gray, Symposium Coordinator, Institute of Polymer Science, The University of Akron, Akron, OH 44325-3909, USA.

Chemical thermodynamics

17–22 July
13th International Conference on Chemical Thermodynamics.
Clermont-Ferrand, France.
Prof. J.-P. E. Grolier, Laboratoire de Thermodynamique et Génie Chimique, Université Blaise Pascal, Clermont-Ferrand, 63177 Aubière, France.

Carbohydrates

17–22 July
17th International Carbohydrate Symposium.
Ottawa, Canada.
Dr H. Jennings, Institute of Biological Sciences, National Research Council of Canada, 100 Sussex Drive, Ottawa, Ontario, Canada K1A OR6.

Excitonic processes in condensed matters

19–22 July
International Conference on Excitonic Processes in Condensed Matters.
Darwin, Australia.
Dr J. Singh, Faculty of Science, Northern Territory University, PO Box 40146, Casuarina, NT 0811, Australia.

Coordination chemistry

24–29 July
30th International Conference on Coordination Chemistry.
Kyoto, Japan.
Prof. H. Ohtaki, Laboratories of Coordination Chemistry, Institute for Molecular Science, Myodaiji-cho, Okazaki 444, Japan.

Polymer networks 94

25–29 July
35th Microsymposium on Macromolecules.
Prague, Czech Republic.
35th Microsymposium, P.M.M. Secretariat, c/• Institute of Macromolecular Chemistry, Academy of Sciences of the Czech Republic, 162 06 Prague 6, Czech Republic.

Physical organic chemistry

September
12th International Conference on Physical Organic Chemistry.
Padova, Italy.
Prof. G. Scorrano, Dipartimento di Chimica Organica, Università degli Studi di Padova, Via Marzolo 1, 35100 Padova, Italy. Fax: +39 (49) 831222.

Liquid crystal polymers

6–9 September 1994
International Conference on Liquid Crystal Polymers.
Beijing, China.
Prof. Xibai Qiu, Chinese Chemical Society, PO. Box 2709, Beijing 100080, China.

Organic synthesis

11–16 December
10th International Conference on Organic Synthesis.
Bangalore, India.
Prof. G. S. R. Subba Rao, (Secretary, ICOS-10), Department of Organic Chemistry, Indian Institute of Science, Bangalore 560 012, India.

1995

Toxicology and clinical chemistry of metals

10–13 July
5th COMTOX Symposium on Toxicology and Clinical Chemistry of Metals.
Vancouver, BC, Canada
Prof. F. W. Sunderman Jr, Departments of Laboratory Medicine and Pharmacology, University of Connecticut Medical School, Post Office Box 1292, Farmington, Connecticut 06034-1292, USA. Tel.: +1 (203) 792328. Fax: +1 (203) 6792154.

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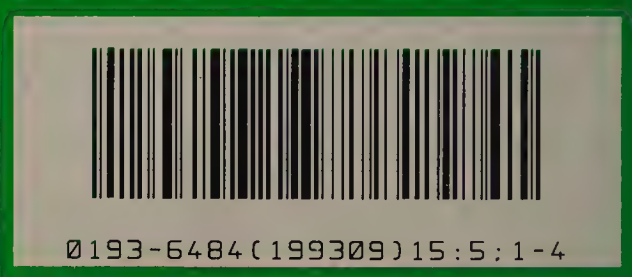

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1993, Vol. 15, No. 6 (November)

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Selection of recently published papers:

J. Valyon and W. K. Hall: On the preparation and properties of CuZSM-5 catalysts for NO decomposition

J. C. Edwards and E. C. Decanio: Observation of [Al(OH)n(H2O)6-n]n(MoO4) in hydrotreating catalyst precursors by solid-state 27Al NMR

K. Yogo, M. Umeno, H. Watanabe and E. Kikuchi: Selective reduction of nitric oxide by methane on H-form zeolite catalysts in oxygen-rich atmosphere

F. M. Bautista, J. M. Campelo, A. Garcia, D. Luna, J. M. Marinas and A. A. Romero: AlPO4-Al2O3 catalysts with low alumina content. III. Surface basicity of catalysts obtained in aqueous ammonia

O. A. Anunziata and L. B. Pierella: Nature of the active sites in H-ZSM-11 zeolite modified with Zn (2+) and Ga (3+)

A. G. Stepanov and K. I. Zamaraev: 13C solid state NMR evidence for the existence of isobutyl carbenium ion in the reaction of isobutyl alcohol dehydration in H-ZSM-5 zeolite

J. Datka, W. Kolidziejski, J. Klinowski and B. Sulikowski: Dealumination of zeolite Y by H4EDTA

S. C. Reyes, C. P. Kelkar and E. Iglesia: Kinetic-transport models and the design of catalysts and reactors for the oxidative coupling of methane

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A measure for all things –
New international standard for quantities and units

Anders J. Thor

There is an old saying, 'No standards no trade'. This is certainly true for quantities and units. Without consensus on these, trade, from shopping at the supermarket to exporting goods worldwide, would be a very haphazard affair indeed. Therefore, the International Standard ISO 31, *Quantities and units*, which consists of 14 separate parts, is not only an important standard in itself; it also serves as a basis and guideline for many other international standards. In 1992, a completely revised edition of ISO 31 was published. This new edition cancels and replaces the earlier edition, which was more than 10 years old. In addition, the International Standard ISO 1000, *SI units and recommendations for the use of their multiples and of certain other units*, was revised at the same time.

Some people consider that there are four systems of writing which bridge all linguistic barriers regardless of the alphabet used. These systems are:

- the set of mathematical signs and symbols
- the International System of Units (SI)
- the symbols for chemical elements, and
- the way of writing notes for music

You can understand the fundamental importance of ISO 31 when you realize the first three systems mentioned are given in this standard. It is only music which is outside the scope of ISO 31.

The International System of Units (*Système Internationale d' Unités, SI*) was adopted by the General Conference of Weights and Measures *(Conférence Général des Poids et Mesures, CGPM*) in 1969. This system of units is coherent with respect to a corresponding system of quantities. This means that the equations between numerical values expressed in SI units have exactly the same form as the corresponding equations between the quantities. Therefore, the only numerical factor that appears in the relation between SI units is the number (1), e.g. 1 J (joule) = 1 N·m (Newton metre) = 1 W·s (watt second) = 1 V·A·s (volt ampere second). That is the reason why it is so convenient to use the SI units – there are no other conversion factors other than 1.

The system of quantities, on which the SI is based, is not within the scope of CGPM. This question is handled by the Technical Committee ISO/TC 12, *Quantities, units symbols, conversion factors*, and the result of the committee's work is given in ISO 31.

Basis

The basis of the SI is the MKSA-system (metre, kilogram, second, ampere) which was first proposed by Giovanni Giorgi in 1901. In 1960, CGPM added the two base units, kelvin (unit of thermodynamic temperature) and candela (unit of luminous intensity), which together with Giorgi's four base units were the basis for the SI. In 1971, the mole (a measure of amount of substance) was added as the seventh base unit of the SI. See table 1. The kilogram is the only coherent SI unit which, for historical reasons, has a prefix (kilo) in its name.

Each coherent system of units contains base units and derived units. However, when the SI was adopted in 1960, there was a third class, the supplementary units, i.e. radian (rad) and steradian (sr) for plane angle and solid angle, respectively. This was a compromise, because it was not possible to come to an agreement at that time on whether radian and steradian should be base units or derived units. In fact, there were two SI systems, one with seven base units, and one with nine base units. However, in 1980, the International Committee for Weights and Measures (*Comité international des poids et mesures*, *CIPM*) decided to interpret the radian and the steradian as derived units. Therefore, the SI presented in the new edition of ISO 31 is unambiguous and founded on seven independent base units.

For the user, there was no great difference between the seven base units SI ad the nine base units SI.

Anders J. Thor is Assistant Professor of Mechanics at the Royal Institute of Technology in Stockholm, Sweden. He has been Secretary of the Technical Committee on Quantities and Units of the Swedish Standards Institution (SIS) since 1975 and Secretary of ISO/TC 12, *Quantities, units, symbols, conversion factors*, since 1981. At the beginning of 1992, he was also appointed Secretary of ISO/TC 203, *Technical energy systems*. He represents ISO on IUPAC's Interdivisional Committee on Nomenclature and Symbols (IDCNS).

The international prototype of the kilogram (centre) in force since 1889, is the only physical specimen that remains valid today.

However, from the point of view of principle, the consistent use of the unambiguous seven base units SI is the most important change in the new edition of ISO 31. In the seven base units system, radian and steradian are two special names for the derived unit, one, symbol 1. For the derived units, including the supplementary units, see tables 2 and 3.

The coherent system of SI base units and SI derived units covers practically all fields of science and technology.

In order to avoid large or small numerical values, decimal multiples and sub-multiples of the SI units are added to the coherent system. They are formed by means of the prefixes listed in table 4. The four prefixes, yatta, zetta, zepto and yocto, are new in the 1992 edition of ISO 31; they were adopted by CGPM in 1991.

In Part 0 of ISO 31 there is a new subclause on the unit one, symbol 1, which is the coherent SI unit for all quantities of dimension one ('dimensionless' quantities). Decimal multiples and sub-multiples of this unit are expressed, by powers of 10, because the unit one cannot be combined with a prefix.

Some basic concepts

A **base quantity** is one of the quantities, within a system of quantities, which is defined independently.

A **derived quantity** is defined, within a system of quantities, as a function of the base quantities of that system.

A **base unit** is a unit of a base quantity.

In a **coherent system of units**, no numerical factor other than one (1) appears in the derived units when they are expressed in terms of base units.

Supplementary units make up a third class of units in the International System of Units (SI) for which the General Conference on Weights and Measures left the question open as to whether they should be considered as base units or derived units. The supplementary units have later been interpreted as derived units in the SI.

In some cases, the symbol % (per cent), is used for the sub multiple 0.01. In some countries the symbol ‰ (per mill) is used for the sub multiple 0.001. Since per cent and per mill are numbers, it is, in principle, meaningless to speak about 'percentage by mass' or 'percentage by volume'. Additional information , such as % (m/m) or % (v/v), should not, therefore, be attached to the unit symbol. In fact, you should never 'decorate' international unit symbols. The information about the special nature of the quantity, or context of measurement under consideration should be carried by the quantity, not by the unit, Hence, the correct way of expressing, for example, a mass fraction is 'the mass fraction is 0.67', or 'the mass fraction is 67%'.

Abbreviations such as ppm, ppb, etc. should not be used, One reason, among others, is that billion in 'part per billion' is ambiguous (a million million, or a thousand million?)

Additional units

Even if the SI covers practically all fields of science and technology, there are certain units outside the SI which are recognized by the CIPM as having to be retained for use together with the SI. See tables 5 and 6. ISO/TC 12 has added a very few units to those listed in the tables 5 and 6, and included them in the tables of units in ISO31. These additional units are neper, Np, bel, B, phon, sone and octave. In practice, the submultiple decibel, dB, is commonly used instead of the bel.

In view of the force of existing practice in certain fields, the CIPM has also admitted the 12 units in table 7 for temporary use, together with the SI. These units are mentioned where appropriate in the 'Remarks' column in ISO 31, together with the conversion factor.

Finally, units in the CGS system, units based on the foot, pound and second (Imperial units) and some other out-of-system units, such as light year, different horse powers and calories and degrees Fahrenheit, are given in informative annexes to the different parts of ISO 31. The use of these units is depreciated and they are given for information only, especially for the conversion factors, which belong to the scope of ISO/TC 12.

Table 1 SI base units

Base quantity	Name	Symbol
length	metre	m
mass	kilogram	kg
time	second	s
electric current	ampere	A
thermodynamic temperature	kelvin	K
amount of substance	mole	mol
luminous intensity	candela	cd

Table 2 SI-derived units with special names, including SI supplementary units units

Derived quantity	Special name	Symbol
plane angle	radian	rad
solid angle	steradian	sr
frequency	hertz	Hz
force	newton	N
pressure, stress	pascal	Pa
energy, work, quantity of heat	joule	J
power, radiant flux	watt	W
electric charge quantity of electricity	coulomb	C
electric potential, potential difference, tension, electromotive force	volt	V
capacitance	farad	F
electric resistance	ohm	Ω
electric conductance	siemens	S
magnetic flux	weber	Wb
magnetic flux density	tesla	T
inductance	henry	H
Celsius temperature	degree Celsius	°C
luminous flux	lumen	lm
illuminance	lux	lx

Table 3 SI units with special names admitted for reasons of safeguarding human health

Derived quantity	Special name	Symbol
activity (of a radionuclide)	becquerel	Bq
absorbed dose, specific energy imparted, kerma, absorbed dose index	gray	Gy
dose equivalent, dose equivalent index	sievert	Sv

Table 4 SI prefixes

Factor	Name	Symbol
10^{24}	yotta	Y
10^{21}	zetta	Z
10^{18}	exa	E
10^{15}	peta	P
10^{12}	tera	T
10^{9}	giga	G
10^{6}	mega	M
10^{3}	kilo	k
10^{2}	hecto	h
10	deca	da
10^{-1}	deci	d
10^{-2}	centi	c
10^{-3}	milli	m
10^{-6}	micro	μ
10^{-9}	nano	n
10^{-12}	pico	p
10^{-15}	femto	f
10^{-18}	atto	a
10^{-21}	zepto	z
10^{-24}	yocto	y

Table 5 Units used with the SI

Quantity	Name	Symbol
time	minute	min
	hour	h
	day	d
plane angle	degree	°
	minute	′
	second	″
volume	litre	l,L
mass	tonne	t

Table 6 Units used with the SI, whose values in SI units are obtained experimentally

Quantity	Name	Symbol
energy	electronvolt	eV
mass	unified atomic mass unit	u

Name	Symbol
nautical mile	–
knot	–
Ångström	Å
are	a
hectare	ha
barn	b
bar	bar
gal	Gal
curie	Ci
röntgen	R
rad	rad
rem	rem

Table 7 Units in temporary use with the SI

(Unlike the other tables in this article, which are modified versions of those appearing in Part 0 of ISO 31, table 7 is drawn from *Le Système International d'Unités (SI)*, 6th edn, BIPM).

Flying and floating exceptions

In 1978, the CIPM decided that it was acceptable for those 12 units listed in table 7 to be used together with SI units until the CIPM considered their use no longer necessary. All these units, except the nautical mile, the knot, the curie and the röntgen, are decimal multiples, or sub-multiples of SI units. There is no real problem in replacing these decimal multiples and sub-multiples by relevant units in the SI. The same applies to the nondecimal multiples, curie and röntgen, which in most cases have already been replaced by the SI units, becquerel and coulomb per kilogram, respectively.

The big remaining problem is the units, nautical mile and knot, employed for marine and aerial navigation. The nautical mile is a convenient unit, if longitude and latitude are expressed in terms of degrees and minutes of arc. One minute of arc at the centre of the Earth corresponds to one nautical mile on the surface of the Earth. Of course, there are small variations because the Earth is not a perfect sphere. The use of the nautical mile is one of the reasons why the unit, minute of arc purposes than navigation, it is, however, recommended that the unit, degree, is subdivided decimally, e.g. 17.25° instead of 17°15´.

There also exists a system for navigation where metric units are used. In fact, that system stems from the initial definition of the metre during the French Revolution. One metre is the fraction 1/10 000 000 (one over ten million) of the distance from the North Pole to the equator. If you subdivide the right angel between the Pole and the Equator decimally, i.e. in 100 gon instead of in 90°, then 1 cgon (centigon) corresponds to 1 km at the surface of the Earth. This system with decimal subdiversions is, in fact, much simpler to use than the present system used for navigation today. In fact, the system based on gon and kilometres is used for surveying in many countries.

The reason why the old and more complicated system – with successive conversion factors like 90, 60 and 60 for degrees, minutes and seconds – is still used, is that the change over must be coordinated and take place at the same time all over the world. How this could be done is described in detail in an article by Sven Stubert published in the *Journal of Navigation*, Vol. 44, No. 3 (Sept 1991), The Royal Institute of Navigation, Cambridge University Press.

Would that not be a challenge for ISO, together with other responsible organizations such as the International Bureau of Weights and Measures, the international Civil Aviation Organization and the International Maritime Organization to carry out the change over to metric units in navigation before the next century.

Implementation of the SI

It is 200 years since the metric system was first established during the French Revolution. The first prototypes of the metre and the kilogram were ready in 1799. At that time, there was also a decimal time scale: the day was divided into 10 hours and the hour into 100 minutes. There were 10 days in the 'metric week'. This time scale never became popular; people preferred the one rest day each seven days, instead of one rest day only each 10 days.

In 1875, the French Government took the initiative to an International Convention on the metre. This convention – the Metre Convention – was signed by 17 countries, among others the United States of America and the United Kingdom. Through the Convention, the International Bureau of Weights and Measures (*Bureau international des poids et mesures, BIPM)* and the CGPM were established. The Bureau is situated in Sèvres, just outside Paris.

In 1960, the CGPM adopted the enlarged metric system and gave it the name International System of Units (*Système International d'Unités*) with the abbreviation, SI.

The SI is now adopted as a national standard in practically every country in the world. However, old unit systems are still used in some countries, especially in the USA, but also in the United Kingdom. For example, road signs and speed limits are given in Imperial Units such as miles and miles per hour. In the USA you buy your daily food in pounds, gallons or fluid ounces. In the United Kingdom, which is a member of the European Community, you will find more and more goods traded in metric units.

There are, however, certain sectors which have been completely metric, even in the USA. For example, dimensions for film have always been metric: 8 mm, 16 mm, 24 mm × 36 mm, etc. In electrotechnology, the SI units such as ampere, volt, watt, ohm, etc., have been used since the beginning of this century, which is long before the SI was adopted.

The industry outside electrotechnology is also going metric step by step in the USA. All specifications for the defence industry have long been in metric units. It has recently been decided that all federal orders to industry from now on shall be given in metric units. All certificated from NIST, the National Institute for Standards and Technology are also, for many years now, given only in SI units. Thus, there is hope that the largest industrial nation shall eventually become metric, even if it is the last to do so.

An addition to the bill

Professionals love talking shop. When experts gather to develop International Standards, the discussions often continue after the formal work sessions. Sometimes, the basis for an agreement is laid during a coffee break, or at the dinner table, as the following anecdote illustrates.

In the 1992 edition of ISO 31, *Quantities and Units,* the so-called supplementary units, radian (rad) and steradian (sr) for plane angle and solid angle, respectively, are presented as derived units. and not as base units. Today, this seems to be a self-evident choice; there was no vote against this decision, nor even a single comment from the ISO members on this rather fundamental matter, when the new edition of ISO 31 was approved. The situation has not always been so easy, as can be seen from the difficulties when the SI was first adopted in 1960 and a third class of units-supplementary units – was added to base units and derived units.

In 1978, that is, 18 years after the adoption of the International System of Units, there was a plenary meeting of ISO/TC 12 in Copenhagen and that was 'the beginning of the end'. The problem with the supplementary units was not on the agenda for the meeting. On the evening of the first day,

the Swedish delegation (Erik Rudberg, Olof Bager, Rolf Ohlon and the author of this article) had dinner at an old restaurant, Stephan À. Porta, at Kongens Nytorv. During the dinner, a lively discussion on the status of the supplementary units came up, which led to a resolution being drafted on the back of the bill. In this resolution, CIPM was asked to make it clear that the supplementary units were derived units and not base units.

The following morning, the head of the Swedish delegation, Erik Rudberg, presented the draft resolution to ISO/TC 12 as a Swedish proposal. It was supported by Olof Bager, who at that time was the Chairman of IEC/TC 25. (IEC/TC 25 is the Technical Committee responsible for quantities and units within the IEC). After discussions, inside and outside the meeting, the Swedish proposal was adopted by the plenary meeting as Resolution 3. Two years later, in 1980, CIPM decided to follow the Resolution from Copenhagen and the supplementary units finally became derived units in the SI. Not until now this has been implemented in ISO 31.

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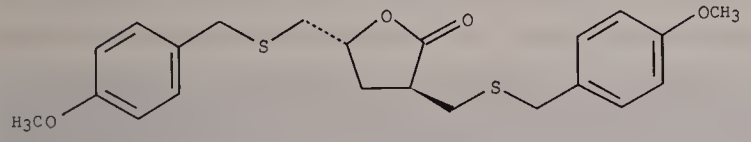
Twelve million – and growing

In 1992, Chemical Abstracts Service published its 14-millionth abstract, and in 1993 it registered the 12-millionth chemical substance, IUPAC affiliate Dr W. Val Metanomski reports.

The January 1991 issue of *Chemistry International* included on page 7 a report on Chemical Abstracts Service (CAS) milestones such as the 10-millionth chemical substance registered and the 13-millionth abstract published.

After a short period of about 2 years, new milestones have been recorded by CAS. In 1993, the 12-millionth chemical substance was registered:



***trans*-dihydro-3,5-bis[[[(4-methoxyphenyl)methyl] thio]methyl]-2(3*H*)-furanone [*145687-69-0*]**

reported by three Japanese researchers in a World Intellectual Property Organization's PCT (Patent Cooperation Treaty) International Application (*CA* 118(15):147453p).

It is interesting to note that a paper presented in 1954 at an American Chemical Society meeting predicted the growth of known organic compounds from 600 000 to 1 000 000 in 20 years. Yet, by the end of 1974 the CAS Registry System had already close to 3 000 000 records on unique chemical substances, 96% of which contained carbon. Ten years later in 1984, the total number was close to 7 000 000. In the period 1990 – 1992, the annual increase was well over 600 000. If the current trend continues, we might reach 16 000 000 in 1998!.

In June 1992, CAS reached another milestone by publishing the 14-millionth abstract that reported on a Canadian paper entitled 'Real-time monitor for thin-film etching in atomic oxygen environment'. (*CA* 116(22): 220060y).

According to the '1907–1992 CAS Statistical Summary', CAS in 1992 abstracted and indexed 532 437 papers, patents, and other publications, and additionally cited 135 831 equivalent patents.

In 1992, the largest share of the journal literature continued to come from the USA (27.4%), followed by Japan (13.2%), Germany (7.4%) and Russia (6.5%). In 1982, the USSR was the second leading source of chemical papers (17.6%) with Japan being the third (10.2%). The share of the People's Republic of China rose from 1.8% in 1982 to 4.7% in 1992.

In 1992, the list of 188 countries, reflecting the location at which the reported work was done, included such countries as Afghanistan (2 papers), Chad (1 paper), Guadelupe (2 papers), Mongolia (7 papers), Swaziland (1 paper) and Yemen (5 papers).

Japanese patents made up 58.8% of the 98 505 patents abstracted in 1992, and 26.8% of the 135 831 equivalent patents cited. The European Patent Office was the second leading source of patents abstracted (10.8%) and equivalent patents cited (17.9%).

Chemical literature papers published in the English language predominated in 1992 (79.3%, up from 67.6% in 1982). The Russian language continued to be the second language (7.6%, down from 16.5% in 1982), followed by Japanese (4.7%, up from 4.2% in 1982), Chinese (3.2%, up from 1.7% in 1982), and German (2.3%, down from 3.8% in 1982). The total of 53 languages encountered in 1992 included Basque (2 papers), Esperanto (2 papers), Kazakh (5 papers), Kurdish (3 papers), Swahili (1 paper), and Tibetan (1 paper).

A 5-year comparison between 1987 and 1992 shows a larger growth in the applied chemistry and chemical engineering sections (15.4%) and macromolecular chemistry sections (14.6%) of *CA* as compared with the total growth of all *CA* abstracts in that period (11.8%). More than a 40 % increase was noted in the sections on mammalian pathological biochemistry; immunochemistry; nonferrous metals and alloys; and ceramics. More than 50% increase was noted in the sections on amino acids, peptides, and proteins; carbohydrates; electric phenomena; and magnetic phenomena.

PAC Review

Pure and Applied Chemistry (*PAC*) is IUPAC's official journal. It publishes the main invited lectures of symposia sponsored by the Union; the recommendations of its Commissions on nomenclature, symbols and units, and technical reports on standardization, recommended procedures, collaborative studies and data compilations. Summaries of the most recent IUPAC recommendations on nomenclature and symbols, and technical reports appearing in *PAC* are published in *Chem. Intl.* in the section Recent Reports. In this section we take a brief look at the symposia and lectures published in recent issues of *PAC*.

Natural products – from medicine to meteorites

The June 1993 issue of *Pure Appl. Chem.* is devoted to the plenary lectures presented at the 18th International Symposium on the Chemistry of Natural Products held in Strasbourg, France, on 30 August – 4 September 1992.

Symposium President Guy Ourisson and Symposium Editor Robert Wolff write in the Preface that the Symposium broke traditional boundaries – and the participants liked it. Even the lectures on the final day, often deserted in similar meetings despite the use of the well known trick of placing particularly appealing (or compliant) lecturers as 'rear engines', were well attended.

The Symposium aimed, according Wolff and Ourisson, to provide a panoramic view of 'the chemistry of organic natural substances, from meteorites to sediments, from their biosynthesis to their uses as drugs, from the smallest ones to the largest proteins, nucleic acids or polysaccharides, from their origin (and the origin of life) to their synthesis by unexpected chemistry, from those natural substances most popular as tests of manhood for ambitious American Assistant Professors to domains hardly known by most of the participants except close specialists, or even entirely novel ...' They recall that, at the time of the first IUPAC symposia in this series, 'natural products chemistry' meant essentially 'structure elucidation of components of higher plants'.

The lectures published in this issue of *Pure Appl. Chem.* are essentially review articles related to the oral presentations of the lecturers.

Traditional medicine in China

Donglu Bai (Shanghai, Peoples Republic of China) in his paper on 'Traditional Chinese medicines and new drug development' points out that recent study of the traditional medicines in China has given us confidence that what was recorded in Chinese ancient medical literature through empirical observations is indeed still coincident with modern

Meteorites bring coded messages from extraterrestrial space. Chemists in Belgium are trying to unravel this information. (*NASA photo.*)

chemistry, pharmacology and medicine. Bai uses an antimalarial drug, artemether, and an acetylcholinesterase inhibitor hyperzine A, as examples.

In his paper on 'How Nature builds the pigments of life' A. R . Battersby (Cambridge, UK) focuses on the biosynthesis of vitamin B_{12}. André Brack (Orléans, France) suggests, in his lecture 'From amino acids to prebiotic active peptides: A chemical reconstitution' that primitive life can be schematically described as organic molecules processed by liquid water. Amino acids were most likely available on the primitive Earth, home-made from the primitive atmosphere or in hydrothermal vents. Brack states that import of extraterrestrial amino acids may represent an alternative supply.

Why pentoses and not hexoses?

'Why did Nature choose pentoses and not hexoses as sugar building blocks in her nucleic acids?' asks Albert Eschenmoser (Zürich, Switzerland) in his paper on 'Hexose nucleic acids'. Eschenmoser explains that since the potential for constitutional self-assembly for hexoses is comparable to that of pentoses, Nature's choice of pentoses must have had functional reasons. The question can be dealt with experimentally by synthesizing hexose analogues of natural nucleic acids, studying their chemical properties and systematically comparing these properties with those of their natural counterparts. Differences in such properties can be expected to reflect reasons why pentose nucleic acids are – as is implicit in the fact of their existence – superior to hexose alternatives with respect to biological function.

Eschenmoser's lecture includes a summary of the results of an experimental study on the pairing properties of synthetic oligonucleotides that contain 2,3-dideoxy-glucopyranose in place of 2-deoxy-ribofuranose as a sugar building block. This structure type ('homo-DNA') is a highly efficient autonomous pairing system with a pairing behaviour that is in part similar to, but also strikingly different from, the pairing behaviour of DNA.

Stephen Hanessian (Montreal, Canada) presents an overview of various strategies aimed at the total synthesis of natural products, with particular emphasis on some clinically important molecules. Of necessity, he says, total synthesis must also incorporate the elements of absolute stereochemistry, and the ultimate objective of obtaining enantiomerically pure or enriched products. In this regard, the chiron approach which capitalizes on the recognition and eventual use of readily available, chiral non-racemic starting materials, has been very successful over the years. His paper is entitled 'Reflections on the total synthesis of natural products: Art, craft, logic, and the chiron approach'.

Carbonaceous chondrites

J. Reisse and F. Mullie (Brussels, Belgium) open their paper 'On the origins of organic matter in carbonaceous chondrites', with the statement that 'Meteorites are fascinating objects'. They come from extraterrestrial space and bring us messages about the Solar System as it was 4.6 billion years ago. However, these messages are coded so we need to find the keys to these codes.

Carbonaceous chondrites are a sub-class of meteorites that contain organic matter. This organic matter is a very complex mixture of various kinds of organic molecules together with a highly unsaturated polymer called kerogen.

The origins of this organic matter remain a subject of active research. In their paper, Reisse and Mullie describe work on volatile hydrocarbons. Ratios of heavy to light stable isotopes of carbon and hydrogen are known for this class of molecules. Comparisons between these values and the corresponding values obtained for samples resulting from Fischer–Tropsch-Type synthesis provide information about the origin of volatile hydrocarbons. The presolar origin is certainly a plausible scenario, they claim, but the FTT synthesis remains a possibility.

There are 27 papers from the Strasbourg Symposium published in this issue of *Pure Appl. Chem.* They include:

'Structural elucidation and chiral syntheses of insect pheromones and extension of the synthetic approaches' by Guo-qiang Lin (Shanghai, Peoples Republic of China; 'Comprehensive survey of endogenous regulators of crustacean moulting' by Yoko Naya and Midori Ikeda (Osaka, Japan); 'Progress towards the total synthesis of the enediyne anticancer antibiotics' by K. C. Nicolaou and Adrian L. Smith (San Diego, USA); 'Genetically engineered synthesis of natural products' by A. Ian Scott (Texas, USA); 'Biosynthesis and synthesis of bioactive natural lactams' by Christoph Tamm (Basel, Switzerland); 'Superacidic cyclization of terponoids' by P. F. Vlad, (Kishinev, Moldova); 'The cradle chemistry of life: On the origin of natural products in a pyrite-pulled chemoautotrophic origin of life' by G. Wächtershäuser (Munich, Germany); and 'Synthesis of antitumour agents' by J. S. Yadav (Hyderabad, India).

Macrocyclic ligands

The International Symposium on Macrocyclic Ligands for the Design of New Materials for Environmental, Extraction and Recognition Purposes took place at the University of Surrey, UK, on 14–16 September 1992. A report on the Symposium appeared in *Chem. Intl.* earlier this year (Vol. **15**, 50–52, 1993).

The Symposium, which was chaired by Angela Danil de Namor (Commission V.8) was organized by the European Latin American Research Group (ELARG) . This group consists of scientists from European and Latin American institutions. Sponsors of the Symposium were: IUPAC, European Community (International Scientific Cooperation), US Army (European Office) and Imperial Chemical Industries (ICI). Delegates from 31 countries attended the Sympo-

Opening session of the International Symposium on Macrocyclic Ligands.

sium. Eight Latin American countries (Argentina, Peru, Chile, Costa Rica, Uruguay, Paraguay, Dominican Republic and Mexico) were represented. It was the first Symposium in a series of international meetings to be organized by ELARG on a biennial basis, alternatively in Europe and Latin America.

The main objectives of the meeting were:

1 To make Latin American scientists aware of the interest of their European counterparts in collaborating with Latin America and to encourage their participation in an area of research which, despite its applications, has hardly been developed in Latin America.

2 To give European scientists an insight into the problems facing their Latin American counterparts in order to help with the formulation of research projects geared to their needs.

3 To encourage teaching and research collaboration between universities and industries in Europe and Latin America.

4 To facilitate contacts between scientists from both sides with complementary skills.

In order to achieve these objectives, the programme consisted of both scientific sessions and round table discussions. Most aspects of macrocyclic chemistry were discussed in the four scientific sessions which consisted of a total of 10 plenary and 8 invited lectures given by experts in the field. Most of these contributions were published in the July 1993 issue of *Pure Appl. Chem.* In addition there were 17 oral and 25 poster presentations. Besides the programme on macrocyclic chemistry, a session was devoted to Research Activities in Latin America. This session consisted of 15 minute oral presentations given by various delegates from Latin America as well as poster presentations. These contributions were informative and highly appreciated by the delegates from non-Latin American countries.

University of Surrey.

Two round tables were organized. These were: (1) Academic Links with Latin American Universities: New Strategies, with panellists C. Kessler (EC), P. Moyna (Uruguay), I. Wadsö (Sweden) and R. Herrera (USA). (2) The Role of Chemistry in the Industrial Development of Latin America, with panellists: R. Cohen-Adad (France), P. Zuniga Alvarado (Costa Rica), B. Grieveson (UK) and F. H. Marquardt (Chile). Both round tables were followed by active participation of the delegates. Based on the success of this Symposium it has been decided that the Second Symposium of this kind will take place in Buenos Aires, Argentina, in August 1994.

Provisional Recommendations

IUPAC seeks your comments

In this section we publish synopses of IUPAC's latest provisional recommendations on nomenclature and symbols. All comments on these recommendations are welcome and will be taken into consideration. The final revised versions are published in *Pure and Applied Chemistry* and synopses of these are published in *Chem. Intl.* as recent reports.

If you would like to comment on the Provisional Recommendations please write to your nearest national/regional centre requesting a copy of the full report. Copies are not available from the IUPAC Secretariat.

Recommendations for nomenclature and tables in biochemical thermodynamics

Chemical equations are written in terms of specific ionic and elemental species and balance elements and charge, whereas biochemical equations are written in terms of reactants that often consist of species in equilibrium with each other and do not balance elements that are often assumed fixed, such as hydrogen at a constant pH. When the pH and specific ionic components are specified, the apparent equilibrium constant K' for a biochemical reaction is written in terms of sums of species and can be used to calculate a standard transformed Gibbs energy of reaction $\Delta_r G'^0$. Transformed thermodynamic properties can be calculated directly form conventional thermodynamic properties. The dependence of K' on temperature or calorimetry can be used to obtain the standard transformed enthalpy of reaction $\Delta_r H'^0$. Standard transformed Gibbs energies of formation $\Delta_f G'^0(i)$ and standard transformed enthalpies of formation $\Delta_f H'^0$ for reactants (sums of species) can be calculated at various T, pH, pMg and ionic strength (I) if sufficient information about the chemical reactions involved is available. These quantities can also be calculated from measurement of K' for an number of reactions under the desired conditions. Tables of these quantities can be used to calculated $\Delta_r G'^0$ and $\Delta_r H'^0$ for many additional reactions.

Comments on the document are welcome and should be sent by 31 March 1994 to: Prof. R. A. Alberty, Department of Chemistry, Room 6-215, Massachusetts Institute of Technology, 77 Massachusetts Avenue, Cambridge, Massachusetts 02139, USA.

Addresses of National and Regional Centres

The most up-to-date list of national and regional centres is shown below.

Argentina

Dr J. M. Barnett
Director, Indústria y Química
Asociación Química Argentina
Sánchez de Bustamante 1749
Buenos Aires
Argentina

Asia (Australia, Bangladesh, Hong Kong, Indonesia, Iraq, Korea, Malaysia, Nepal, Philippines, Singapore, Sri Lanka, Thailand)

Prof. Sang up Choi
c/o Korean Chemical Society
35 5 - KA Anam Dong
Sungbuk-ku
Seoul 136-075
Republic of Korea

Bulgaria

Prof. O. Peshev
Bulgarian Academy of Sciences
Institute of General and Inorganic Chemistry
Acad. G. Bonchev Str., Block 11
Sofia 1040
Bulgaria

Canada

Prof. J. ApSimon
Director of Research, Dean
Faculty of Graduate Studies and Research
Room 1525, Dunton Tower
Carleton University
Ottawa
Canada K1S 5B6

China/Beijing

Prof. Xibai Qiu
Chinese Chemical Society
POB 2709
Beijing
China

China/Taiwan

Prof. Ta-Shue Chow
Institute of Chemistry
Academia Sinica
Nankang
Taipei
Taiwan 11529
Republic of China

Czech Republic

Dr J. Kahovec
Ustav makromolekulární chemie
Ceskosolvenská nám 2
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Czech Republic

France

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Laboratoire de Physico-Chimie des Interfaces
Université de Provence,
Centre St. Charles
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F-13331 Marseille Cédex 3
France

Germany

Dr Eva E. Wille
Journal Department Manager
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Germany

Hungary

Prof. E. Pungor
Altalános és Analitikai Kemiai Tanszék
Budapesti Müszaki Egyetem
Gellért tér 4
H-1521 Budapest XI
Hungary

India

Dr V. C. Vora
Indian National Science Academy
Bahadur Shah Zafar Marg
New Delhi 110002
India

Italy

Prof. G. Scorrano
President, Società Chimica Italiana
00198 Roma
Viale Liege 48
Italy

Japan

Dr A. Nakanishi
Executive Director
Chemical Society of Japan
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Republic of South Africa

Prof. J. R. Bull
Department of Organic Chemistry
University of Cape Town
Rondebosch 7700
Republic of South Africa

Russia

Prof.G. B.. Bokij
Commission on Nomenclature
National Committee of Russian Chemists
Russian Academy of Sciences
Kosygin Street, 4, SU-1176 977
Moscow V-334
Russia

Sweden

Dr K. Samuelsson
Svenska Nationalkommittén för kemi
Wallingatan 26 B
S-111 24 Stockholm
Sweden

UK

Dr A. D. McNaught
The Royal Society of Chemistry
Thomas Graham House
Science Park
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Cambridge, CB4 4WF
UK

USA

Dr Mary E. Scanlan
Journals Department
American Chemical Society
2540 Olentangy River Road
POB 3330 Columbus
Ohio 43210
USA

Recent Reports

In this section we publish summaries of the most recent IUPAC recommendations on nomenclature and symbols and technical reports. The full texts of these recommendations and reports are published in *PAC*.

Revised nomenclature for radicals, ions, radical ions and related species (IUPAC Recommendations 1993)

These recommendations constitute a comprehensive documentation of nomenclature for organic radicals, ions, and radical ions based primarily on principles given in subsection C–0.8 of the IUPAC *Nomenclature of Organic Chemistry* and illustrated in various subsections of Sections *A, B, C,* and *D* of those Rules. They also extend these principles to noncarbon parent hydrides and provide explicit guidance for describing the presence of radical and ionic centres on the principal characteristic groups of organic nomenclature. Recommendations are given for naming polyradicals, and polycationic, polyanionic and zwitterionic compounds, and are illustrated by complex as well as simple examples.

Two innovations are introduced: (1) the prefix 'ylo-' to indicate the presence of a radical center in a substituent group; and (2) the suffix '-uide' to describe an anion formally derived by the addition of a hydride ion to a parent hydride.

Delocalized radicals and ions are not treated in these recommendations except where such delocalization is included in usual structural considerations.

This report was prepared for publication by W. H. Powell, Commission on Nomenclature of Organic Chemistry, Organic Chemistry Division, and published in Pure Appl. Chem, ***65**, 1357–1455 (1993).*

Nomenclature of regular double-strand (ladder and spiro) organic polymers (IUPAC Recommendations 1993)

Structure-based and source-based nomenclature rules are extended to regular double-strand (ladder and spiro) organic polymers. A double-strand polymer is defined as a polymer the molecules of which are formed by an uninterrupted sequence of rings with adjacent rings having one atom in common (spiro polymer) or two or more atoms in common (ladder polymer). The structure-based nomenclature rests upon the selection of a preferred constitutional repeating unit (CRU) of which the polymer is a multiple. Rules are also provided for denoting substituents and end groups. The source-based nomenclature identifies the starting monomer (s) from which the double-strand polymer is prepared with addition of an appropriate prefix *'ladder-'* or *'spiro-'*.

This report was prepared for publication by W. V. Metanomski, R. E. Bareiss, J. Kahovec, K. L. Loening, L. Shi and V. P. Shibaev, Commission on Macromolecular Nomenclature, Macromolecular Division, and published in Pure Appl. Chem, ***65**, 1561–1580 (1993).*

Biodegradation and leaching of pollutants: Monitoring aspects (Technical Report)

The range and magnitude of pollution of soil and groundwater is governed by numerous processes which determine the fate and the pollution hazard of potential contaminates. Some of the various methods used for the evaluation of these processes, including: indexing, model-

Reports of groundwater contamination through leaching have increased in recent years.

ling, ranking, monitoring and analytical tools are reviewed in this paper, emphasizing the current activity under way in Israel. Significant advances have been made with regard to certain monitoring procedures for toxic metals and other micropollutants in soil and groundwater. However, these advances are experimental and at a development stage and comprehensive and universal approaches have yet to be suggested for routine monitoring of hazardous substances leaching through the soil profile.

This report was prepared for publication by M. Waldman and Y. Shevah, Commission on Water Chemistry, Applied Chemistry Division, and published in Pure Appl. Chem, ***65****, 1595–1603 (1993).*

A collaborative study of the structure and morphology in continuous fiber reinforced PET and PEEK (Technical Report)

The WAXS pattern of the continuous carbon fiber reinforced laminates can be viewed as a superposition of the scattering patterns arising from the carbon fibers and the polymer matrix. In order to obtain the scattering of the matrix alone, the scattering of the pure reinforcing fibers has been measured at different azimuthal angles. A procedure has been developed to subtract the scattering of the fibres from that of the complete laminate. From the correct scattering diagrams, the degree of crystallinity has been determined. Both PET and PEEK based laminates were examined in this study, and crystalline fractions of $x_c = 0.46$ and $x_c = 0.34$ were determined for the PET and PEEK matrix composites, respectively. These values are in good agreement with the results obtained from calorimetric measurements.

In addition, for laminates laid-up in a $\pm 45°$ configuration, it was determined that the actual lay-up angle was $\pm 42.6°$ in the PET laminates, whereas the lay-up angle was measured to be exactly $\pm 45°$ in the PEEK composite. These results illustrate that small variations in lay-up configurations can be detected by the developed procedures.

Pole figures obtained from the PEEK laminates indicated that there was no overall orientation of the matrix. Thus, the pole figures were completely determined by the orientation of the carbon fibres in the laminate and the orientation of the crystals within the carbon fibres.

This report was prepared for publication by J. C. Seferis, D. R. Moore and H. G. Zachmann, Working Party on Structure and Properties of Commercial Polymers, Commission on Polymer Characterization and Properties, Macromolecular Division, and published in Pure Appl. Chem, ***65****, 1581–1593 (1993).*

Publications

Methanol thermodynamic data

Volume 12 *Methanol* is the latest in the series of International Thermodynamic Tables of the Fluid State. It contains a comprehensive survey of all published thermodynamic data on methanol.

The Thermodynamic Tables Project

The Thermodynamic Tables Project was inaugurated in 1963 by the Commission on Thermodynamics and Thermochemistry of the Division of Physical Chemistry with the object of compiling internationally agreed values of the equilibrium thermodynamic properties of liquids and gases of interest to both scientists and technologists. The range to be covered for each fluid is that for which there exist reliable experimental data, and the agreed values are issued as tables upon the basis of which users may produce equations suited to their own special requirements, if the wide-ranging equations given are not appropriate for their purposes. The following tables have already appeared based on these principles:

Vol. 1	Argon, 1971	Butterworths, London (1972)
Vol. 3	Carbon Dioxide	Pergamon, Oxford (1976)
Vol. 4	Helium-4	Pergamon, Oxford (1977)
Vol. 5	Methane	Pergamon, Oxford (1978)
Vol. 6	Nitrogen	Pergamon, Oxford (1979)
Vol. 7	Propylene (Propene)	Pergamon, Oxford (1980)
Vol. 9	Oxygen	Blackwell Scientific Publications, Oxford (1987)
Vol. 10	Ethylene (Ethene)	Blackwell Scientific Publications, Oxford (1988)
Vol. 11	Fluorine	Blackwell Scientific Publications, Oxford (1990)

Volume 10 on Ethylene (Ethene) replaces volume 2 which was published by Butterworths in 1974.

The present volume of Methanol is volume 12 in this series. For important fluids for which the existing data are inadequate to form the basis of extensive tables using the above criteria, a combination of experimental data and estimation is used to construct 'tentative' tables. The following volume was the first to appear in this series:

Vol. 8	Chlorine Tentative Tables	Pergamon , Oxford (1985)

Methanol

World production capacity of methanol was about 22 megatonnes in 1989 and is growing fast having almost doubled in the last decade. The major use is still as a chemical feedstock for such products as formaldehyde, which is used in the manufacture of amino and phenolic

Methanol is used widely as a chemical feedstock, a process solvent and an additive to unleaded petrol.

resin adhesives, and it is also used extensively as a process solvent. More recent and rapidly expanding uses are the result of environmental legislation in the developed world which requires the use of cleaner fuels. Methanol is used in the production of ethers, such as methyl tert-butyl ether (MTBE), which are blended with petrol to decrease hydrocarbon, carbon monoxide and nitrogen oxide emissions from motor vehicles; it is also used as an additive to raise the octane levels of unleaded petrol. Developments are in progress for other new fuel uses for methanol such as in diesel and petrol engines and as a boiler fuel. Methanol also has scientific importance as the first member of the l-alkanols.

There is a very extensive literature on methanol dating back to the early work of Romsay and Young and of Amagat towards the end of the last century, but because of experimental problems, a thorough critical review revealed only a limited amount of accurate data. The first equations which were developed to cover the major portion of the fluid surface are those by Xubarev, Prusakov and Sergeeva, which were published in 1973. The most recent equation of state is that by Goodwin published in 1987 but since then several new and more accurate sets of measurements have become available which have addressed the problems caused by association and decomposition. Because of this and the rapid growth in the uses of methanol, improved accuracy in the representation of the thermodynamic properties by an equation of state will assist in improving the design of new processes and equipment.

Thermodynamic consistency between the various properties which are given in the tables of the book is assured if the available data are used to construct an equation of state from which all the other properties can be evaluated by mathematical manipulation. The most convenient function to use is the Helmholtz energy and so the appropriate independent variables are density and temperature. The dimensionless function selected for use in this book is a reduced Helmholtz energy, $A/(RT)$, represented by

$$A/RT = \alpha(\omega,\tau) + \ln(\omega/\omega_a) + \alpha^{id}(\tau).$$

The dimensionless density and temperature variables are ω *and* τ; α is a function which represents the behaviour of the real fluid, and the ideal gas is represented by α^{id} together with the logarithmic term. Since there is no absolute scale of Helmholz energy an arbitrary reference state has been taken as the point $(\omega_\alpha,\tau_\alpha)$ in the ideal gas where S^d and H^d are both set to zero. All other thermodynamic properties which are tabulated in the main tables of this book can be derived from this single equation by differentiation alone.

The major portion of Section 1 of the text of this book is concerned with a discussion of the available data and the accuracy with which they are represented by the equation of state. Section 2 contains a description of the construction of the equation of state. For the convenience of users who are only interested in restricted states of the fluid, a number of auxiliary equations are given in Section 3. These include equations for the vapour pressure, the enthalpy of evaporation and the density–temperature relations of the saturated liquid and vapour; separate equations for the temperature dependence of the isobaric heat capacity, entropy and enthalpy of the ideal gas; and an equation which represents the behaviour of the gas phase, Section 4 explains how the tabulated properties were calculated from the equation of state and gives lists the necessary derived functions in order to assist those who wish to prepare computer programs for them.

The properties tabulated in the tables of this book are the volume, entropy, enthalpy, isobaric heat capacity, compression factor, fugacity/ pressure ratio, Joule–Thomson coefficient, ratio of the heat capacities and speed of sound as functions of pressure and temperature;. The gas and liquid states are covered from 1.58 Pa to 800 MPa at temperatures from 176 K to 620 K. Zero-pressure tables are given, as are tables of the properties of the fluid phases along the saturation curve and the melting curve.

The equation of state which has been used to calculate the tables in this book has been included in the Imperial College Equations of State Computer Package.

Methanol: International Thermodynamic Tables of the Fluid State – 12 *is edited by K. M. de Reuck and R. J. B. Craven and published by Blackwell Scientific Publications, Oxford, UK, 1993. xxii + 295 pp. ISBN 0-632-03455-6. Price: GBP 39.50/USD 85.00. Members discount price GBP 23.70/USD 51.00.*

Japanese and English glossary

The first comprehensive glossary of scientific and technical terms in Japanese and English has recently been published. The glossary covers 120 subject areas with 3000 chemical terms, 1600 mathematical terms, 3700 physics, 900 computer and logic terms, 3200 engineering terms, and 3700 biology terms. The following are two entries in Part II (the English-into-Japanese Section):

chemist *[ch]*	化学者	kagaku'sha
chemistry *[sci-t]*	化学；化學；かがく	kagaku

Japanese/English English/Japanese Glossary of Scientific & Technical Terms *by Louise Watanabe Tung is published by John Wiley & Sons, Chichester, UK, 1993. xxi + 1146 pp. ISBN 0-471-57463-5. Price: GBP 56.00.*

Dictionary of chemical technology

The *Encyclopedic Dictionary of Chemical* by Dorit Noether and Herman Noether was published by VCH in 1993. Pages 1–43 are devoted to: Abbreviations for compounds/ groups used in formulas; Acronyms for chemicals and methods, Acronyms for organizations (such as IUPAC); and WHO World Health Organization Chemical Emergency Numbers. The first and last entries of the 252-page dictionary section are:

A acid: 1,7-dihydroxy-naphthalene-3,6-disulfonic acid; dye intermediate

zygote: in genetics, a cell formed from the union of two mature reproductive cells

Encyclopedic Dictionary of Chemical Technology *by Dorit and Herman Noether is published by VCH Weinheim; New York, Basel; Cambridge; Tokyo, 1993. 297 pp. ISBN 1-56081-329-3 and 3-527-26696-8. Price: DEM 99.00 and GBP 70.50.*

Croatian translations

The IUPAC Secretariat has recently received copies of the following Croatian translations of IUPAC reports published by SKTH/Kemija u industriji – Zagreb:

Nomenklatura organskih spojeva: Sekcije A, B i C
Nomenklatura organskih spojeva: Sekcije D, E, F i H
Nomenklatura alfa-aminokiselina
Nomenklatura iz podrucja ugljikohidrata
Nomenklatura iz podrucja peptida i proteina
Steroidna nomenklatura
Nomenklatura i terminologija iz podrucja polimera i polimernih materijala.

Chemical tradename dictionary

Published by VCH in 1993, the *Chemical Tradename Dictionary* by Michael Ash and Irene Ash, contains information on over 14 000 tradename chemicals from the entire spectrum of chemical materials used in manufacturing by some 2300 chemical manufacturers.

Areas covered are: cosmetic additives; catalysts; adhesives and sealants; paint additives; detergent materials; wetting agents; emulsifiers; cutting oils; agricultural chemicals; colours and pigments; fillers, modifiers and reinforcing materials; films; plastic compounds, resins and additives; natural and synthetic elastomers, and additives; textile specialty chemicals.

Readers should that note that Iupital® is manufactured by Mitsubishi Gas and not IUPAC – although the applications sound somewhat familiar:

Iupital®. [Mitsubishi Gas] Acetal copolymer; for applics. where resistance to dimensional change, fatigue, wear, and corrosive environments is important.

The second part of this book contains a detailed Manufacturers Directory including all the necessary contact information needed by the user to obtain technical and material handling data sheets on individual products directly from the manufacturer.

Chemical Tradename Dictionary *by Michael Ash and Irene Ash is published by VCH Weinheim; New York, Basel; Cambridge; Tokyo, 1993. xi + 529 pp. ISBN 1-56081-625-2 and 3-527-89625-2. Price: DEM 138.00 and GBP 57.00.*

ISO Standards

The following are some of the new international standards announced by the International Organization for Standardization (ISO) in recent issues of *ISO Bulletin*:

June 1993 issue of *ISO Bulletin:*

TC 42	**Photography**
ISO 417:1993	Photography – Determination of residual thiosulfate and other related chemicals in processed photographic materials – Methods using iodine-amylose, methylene blue and silver sulfide
ISO 9848:1993	Photography– Source document microfilms – Determination of ISO speed and ISO average gradient
TC44	**Welding and allied processes**
ISO 9455-2:1993	Soft soldering fluxes – test methods – Part 2: Determination of non-volatile matter, ebulliometric method
ISO 9455-9:1993	Soft soldering fluxes – Test methods – Part 9: Determination of ammonia content
TC59	**Building construction**
ISO 11431:1993	Building construction – sealants – Determination of adhesion/ cohesion properties after exposure to artificial light through glass
ISO 11432:1993	Building construction – sealants – Determination of resistance to compression
TC61	**Plastics**
ISO178:1993	Plastics – Determination of flexural properties
ISO 179:1993	Plastics – Determination of Charpy impact strength
ISO 180:1993	Plastics – Determination of Izod impact strength
ISO 9664:1993	Adhesives – Test methods for fatigue properties of structural adhesives in tensile shear
TC 92	**Fire tests on building materials, components and structures**
ISO/TR 9122-4 1993	Toxicity testing of fire effluents – Part 4: The fire model (furnaces and combustion apparatus used in small - scale testing)
TC 146	**Air quality**
ISO 10313:1993	Ambient air – Determination of the mass concentration of ozone – Chemiluminescence method
TC 147	**Water quality**
ISO 9964-1:1993	Water quality – Determination of sodium 1993 and potassium – Part 1: Determination of sodium by atomic absorption spectrometry
ISO 9964-2:1993	Water quality – Determination of sodium and potassium – Part 2: Determination of potassium by atomic absorption spectrometry
ISO 9964-3:1993	Water quality – Determination of sodium and potassium – Part 3: Determination of sodium and potassium by flame emission spectrometry
TC 174	**Jewellery**
ISO 11426:1993	Determination of gold in gold jewellery alloys – Cupellation method (fire essay)
TC 194	**Biological evaluation of medical devices**
ISO 10993 -2:1992	Biological evaluation of medical devices – Part 2: Animal welfare requirements
ISO 10993 – 3:1992	Biological evaluation of medical devices – Part 3: Tests for genotoxicity, carcinogenicity and reproductive toxicity

Quality assurance for analytical laboratories

At the present time, when public opinion is demanding accountability of laboratories carrying out analyses related to socially sensitive issues, such as drug testing, blood alcohol monitoring, HIV-testing, water and air purity, acid rain and so on, the importance of harmonizing protocols for quality assurance schemes cannot be over-emphasized. The first step in obtaining the status of 'Certified in Accordance with ...', is for a laboratory to make a full and detailed internal evaluation. *Quality Assurance for Analytical Laboratories*, edited by Michael Parkany, aims to assist in that step.

The book shows how to introduce internal quality assurance schemes that can form the basis for third party assessment, certification and accreditation. It gives real-life examples from a wide range of laboratories, illustrates the statistical tools needed and details the correct terms and their definitions. It also contains a list of all relevant International Standards.

According to the back cover blurb, 'For those laboratories wishing to establish a self-audit for checking conformity with the ISO 9000 series, this book is a must'.

The book is the Proceedings of the 5th International Symposium on the Harmonization of Internal Quality Assurance Schemes for Analytical Laboratories held in Washington, DC, USA, 22–23 July 1993.

Quality Assurance for Analytical Laboratories, *is edited by M. Parkany and published by The Royal Society of Chemistry, Cambridge, UK, 1993. xiii + 197 pp. ISBN 0-85186-705-7. Price: GBP 39.50. The book is available from: (a) Royal Society of Chemistry, Turpin Distribution Services Ltd., Blackhorse Road, Letchworth, Herts. SG6 1HN, UK. Tel: +44 (462) 672555. (b) CRC Press Inc., 2000 Corporate Boulevard N.W., Boca Raton, FL 33431, USA. (c) D.A. Books & Journals, PO Box 163, 648 Whitehorse Road, Mitcham, VIC 3132, Australia.*

Sustainable development

The MAB (Man and the Biosphere) Digest Series was launched by UNESCO in 1989. Volume 12 is entitled *Advanced acquisition and analysis technologies for sustainable development.*

The purpose of MAB Digest 12 is to provide scientific researchers engaged in activities related to sustainable development with an overview of several data collections and information technologies, including remote sensing, geographical information systems and advanced modelling tools. The primary audience is not the experts and practitioners of the technologies and approaches described in the digest, but rather members of the broader scientific community who might wish to have at hand a synoptic overview of the characteristics and potential of new technologies and their possible application to contemporary research challenges. Particular emphasis is given to remote sensing and geographic information systems.

The digest was prepared by an *ad hoc* group on Scientific Information for Sustainable Development set up in 1989 by the Scientific Committee on Problems of the Environment (SCOPE), with support from its parent body, the International Council of Scientific Unions (ICSU), and from the United Nations Development Programme (UNDP), the French Ministry of the Environment and UNESCO.

The chapter headings of MAB Digest 12 are: Summary; Introduction; Data; Spatial data; Technologies; Applications and examples; Issues, needs and trends; Source Material.

Reference

J. E. Estes, M. Ehlers, J-P. Malingreau, I. R. Noble, A. Sellman, J. L. Star and J. Weber, *Advanced Data Acquisition and Analysis Technologies for Sustainable Development.* MAB Digest 12. UNESCO, Paris (1992)

Vocabulary of global warming

Vocabulary of Global Warming: Contributors to the Greenhouse Effect is the first in a series of vocabularies on the environment. Containing nearly 7000 entries, it offers the reader all the new terminology used to describe the recent phenomenon of global warming, including a complete typology of the various categories of major greenhouse gases (NH_4, N_2O, O_3, CFCs). Special emphasis has been given to CFCs or chlorofluorocarbons.

The vocabulary also focuses on the terminology of atmospheric particles (aerosols) and air humidity (clouds), two greenhouse contributors whose behaviour is of vital interest to modellers. The terminology used in connection with the protection of the ozone layer, a related problem of equal importance to the greenhouse effect, has also been carefully researched and included here.

Vocabulary of Global Warming. Vol. I: Contributors to the Greenhouse Effect *is published by Canada Communication Group - Publishing, Ottawa, Canada, 1992. Catalogue No.: S52-2/214-1992. ISBN 0-660-57945-6. Price: CAD 36.95 (Canada); USD 48.05 (other countries).*

Macromolecules

The May 1993 issue of *Die Makromolekulare Chemie: Macromolecular Symposia* (Vol. 70/71) is a collection of invited, plenary and main lectures presented at the 34th International Symposium on Macromolecules (MACRO 92) held under the auspices of IUPAC and the President of Czechoslovakia, Vaclav Havel, in Prague from 13–18 July 1992.

The lectures cover classic fields of polymer science, that is polymerisation chemistry and the structure and properties of macromolecules and polymers. However, the emphasis put on functional polymers, such as pharmaceutical polymers, polymers with remarkable electrical and optical properties, polymeric sorbents, catalysts, reagents, and membranes is marked. Furthermore, new polymer materials, polymer blends and composites, as well as the degradation and stabilization of polymer materials, were also the subjects of a number of lectures. The interdisciplinary nature of polymer science was thus clearly manifested, according to Symposium Editor Jaroslav Kahovec and Symposium Chairman Pavel Kratochvil.

New names and addresses pull-out

Names and Addresses of Officers of IUPAC Bodies 1994–95

(Subject to approval by National Adhering Organizations)

The newly appointed officers of IUPAC bodies take up their duties on 1 January 1994.

Where telephone and telefacsimile (fax) numbers are quoted, the country code, area code in parentheses and subscriber's number are prefixed by a plus sign and this should be substituted by a member's own international country code, which varies from country to country. Electronic mail addresses have been included for members who have supplied this information.

So that female members of the Union can be easily identified, their forenames are printed.

If officers who have not already provided the Secretariat with their telephone and fax numbers, and electronic mail addresses would kindly do so, the records in Oxford can be completed. *Also, will officers please advise the Secretariat of any changes that are necessary, and any errors that need correcting.*

The information printed for each person listed is held in the membership database at the IUPAC Secretariat in Oxford.

BUREAU

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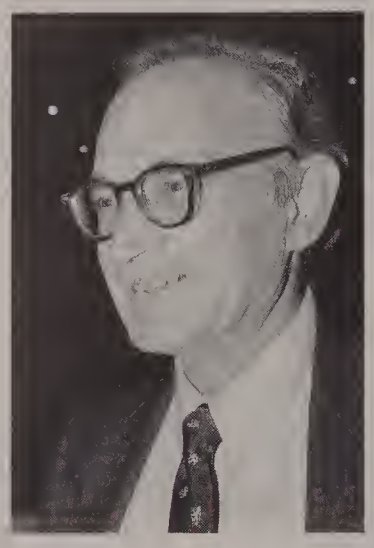
President's Report

This is the text of the Statutory Report of the President on the State of the Union presented by Prof. Allen Bard to the Council at the 37th IUPAC General Assembly held in Lisbon, Portugal.

President Allen Bard.



Introduction

It is usual in state-of-the-union messages to point with pride to recent accomplishments and to suggest changes that are needed within an organization, and I will adhere to this convention. However, I must say at the outset that while I appreciate the many valuable activities carried out by the Union, I generally find it now to be in a precarious situation. I will try to justify this appraisal by considering the present role of the IUPAC within the field of chemistry. We must also be aware that the political changes that have occurred during the last biennium and the economic situation worldwide also strongly affect the Union.

Activities of the Union

The traditional activities of the Union have continued during the last two years, a number of useful reports and monographs have been issued, and many successful conferences have been sponsored. The *IUPAC Handbook 1991–93* lists all of the projects currently being carried out (p.112–169) and lists the reports published in 1990–91 (p.170–177). In addition, in 1992 five nomenclature reports were issued, 37 technical reports and monographs in the 'Chemistry for the 21st Century' series, dealing with catalysis, medicinal chemistry, and advanced materials. Another monograph series recently launched is one on 'Environmental Analytical and Physical Chemistry', with volumes on *Environmental Particles* completed. Also under way are two other interesting projects of the Committee on Publications: a student-oriented book on the language of chemistry (nomenclature) and a floppy disk database of all reports published in PAC through 1991.

Two CHEMRAWN conferences were held. The 'World Conference on the Chemistry of the Atmosphere: Its Impact on Global Change' (CHEMRAWN VII) took place in December, 1991 in Baltimore and was attended by about 380 participants from 48 countries. The conference dealt with such timely problems as changes in the chemical composition of the atmosphere, global warming, and the global carbon cycle and attempted to assess that state of knowledge in these areas and recommend actions and areas of needed research. CHEMRAWN VIII, 'World Conference on Chemistry and Sustainable Development: Toward a Clean Environment, Zero Waste, and Highest Energy Efficiency', was held in Moscow in September, 1992. Scientists from 14 countries discussed how chemistry can help in reducing industrial waste and solving problems of environmental contamination. A second IUPAC Workshop on Safety in Chemical Production, organised by COCI, was held in Yokohama in June, 1993. Additional versions of this very valuable activity are being planned for other locations, such as the USA in 1995. In a related matter, The book '*Chemical Safety Matters*', derived from two US National Research Council volumes, was published in conjunction with the WHO. Finally, I might mention the important 'Chemistry for Life' program being organised by the Committee on Chemistry and Industry to celebrate the 75th birthday of IUPAC in 1994. Activities are already being planned by the chemical societies in several countries. Although time does not permit a detailed description of many of the valuable activities and publications that have resulted from IUPAC efforts, it is clear that IUPAC continues to provide valuable studies and services. I hope the world chemical community appreciates the efforts and hard work of the many work of the many members of the Union in these activities

The State of the Union

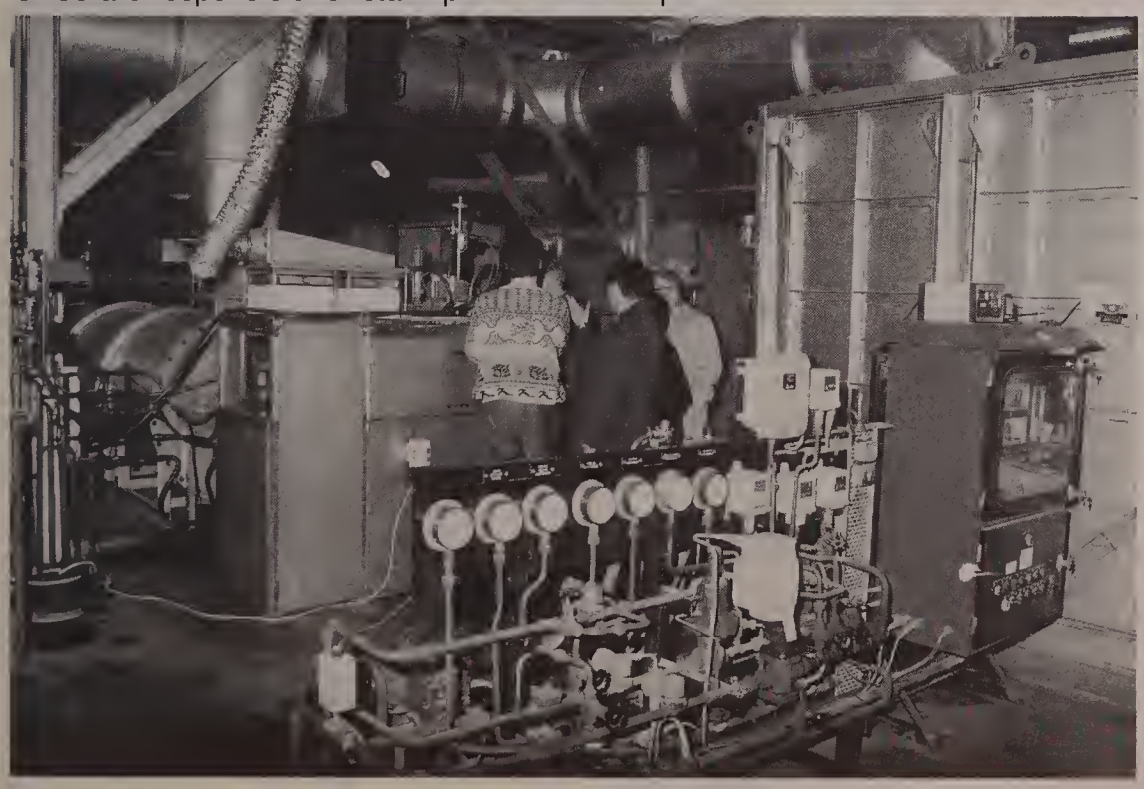
Given the impressive activities of IUPAC outlined above, why do I indicate that the Union is in a precarious situation and why have the last three presidents (my distinguished colleagues C. N. R. Rao, Valentin Kopytyug and Yves Jeannin) all considered it necessary to devote considerable efforts and include discussion in their messages to Council on the subject of restructuring of the Union? The problem is that a large part of the chemical community does not know or care about IUPAC activities. This point has been raised in a forceful manner in the very valuable critical assessment by Vice-President Staab. There is a general feeling that many of the programmes and reports of the Divisions and Commissions are irrelevant and deal with less important topics, while problems of current interest and significance are not dealt with in a timely manner. Perhaps this is partly the reason why we have seen a drop in the number of IUPAC Company Associates and some unwillingness of NAOs to increase their subscriptions to maintain the current level of IUPAC activities. Part of the problem is that Commissions are established when an important problem arises, but they continue to exist long after the original questions that needed to be addressed are answered. Rather than dis-

band the Commission, lower priority programmes and narrow problems are then considered. Moreover, members are often elected to a Commission on the basis of their status and established reputation rather than on their expertise in an important area that needs consideration. Of course the fact that many Commissions only meet every two years also slows down the operations and means that it takes many years for reports to issue, with the result that a report may have lost its impact when it finally appears. Finally, IUPAC remains organised along rather classical divisional lines. This sometimes means that certain areas are covered by several Commissions, often with attendant 'turf battles'. More often, topics of importance 'fall between the cracks' and are not considered by any Commission. As a case–in–point consider the fullerenes. The discovery of this new form of carbon and a whole new class of compounds created opportunities for projects in several Divisions, yet until the Executive Committee established an interdivisional working party, I believe there was no activity in this area. The same can be said about scanning probe microscopes, where standards and conventions on reporting of data are certainly needed, and I am sure in a number of other fields.

IUPAC as an organisation generally seems unwilling to attack major problems that impact the world outside out narrow chemical community. Thus, questions arise in areas like biological effects of electromagnetic radiation, the dangerously expanding world population (contraception), pollution from radioactive waste and chemical weapons production, and world energy needs, where statements and advice from an international body like IUPAC, either alone or in concert with other unions or international bodies, would be very valuable. An example of a project within IUPAC of this nature is the IUPAC Task Force on Scientific Aspects of the Destruction of Chemical Warfare Agents. This group, consisting of 12 chemists from nine countries, is addressing the scientific problems involved in the destruction of the huge and sometimes unstable stockpiles of chemical weapons in a number of countries. Shouldn't we also be willing to establish groups that can address statements made in the popular press, such as that volcano emissions rather than CFCs are responsible for statospheric ozone depletion or that cellular telephones cause brain tumours? While CHEMRAWN conferences have addressed such areas, the ideas and recommendations from these conferences rarely feed back to the Divisions and Commissions and form the basis of new programmes.

Restructuring

It has been the feeling for some time, as addressed by my predecessors, that the structure of the Union, created at a different stage in the development of science, needs changing. Important core activities of the Union should be maintained, but lower priority programmes must give way to a structure that will allow more flexibility in the choice and duration of projects. While the establishment of 'horizontal programmes' did call attention to needed projects in the area of the environment and materials, they really did not represent the type of restructuring that is required. Of course, any attempt at changing an established order is usually met with much resistance. The French statesman Georges Clemenceau said 'It is easier to move a graveyard than change a curriculum'. The same could be said about restructuring an organisation! It would be nice if we could maintain our current activities and, in addition, undertake other new projects and programmes. Unfortunately, the current financial situation does not permit this. Moreover, even



IUPAC Task Force on Scientific Aspects of the Destruction of Chemical Warfare Agents at The Chemical and Biological Defense Establishment, Porton Down, near Salisbury, UK. (*Photos courtesy CBDE.*)

'IUPAC as an organization generally seems unwilling to attack major problems that impact the world outside our narrow chemical community – for example, world energy needs.'

if funds were available, it is not reasonable to continue activities which are not of interest to the broad chemical community. IUPAC should not be a place where national adhering organisations and industry are expected to support highly specialized projects of narrow interest, especially while other more important work in our field is left unpursued.

A plan for restructuring has been proposed by the Executive Committee. The basic concept is to decrease some of the fixed structure of the Commissions by creating a pool of titular members that can be assigned to specific projects of broad interest and defined duration. These members would be assigned by the Executive Committee based on proposals for such projects originating in the Divisions, Bureau, or even Council. The flexibility of this arrangement should encourage interdisciplinary and interdivisional programmes as well as allow the establishment of focused groups in response to projects from associated organisations, such as ICSU. Moreover, the funding of such limited lifetime titular member groups could be such that more frequent meetings could be arranged, so that the completion of projects and preparation of reports could be accomplished in a reasonable time period (i.e., 1–2 years). I can see few reasons to object to such an arrangement, since the overall level of scientific activity of the Union is maintained, and I hope that this plan is adopted.

Conclusions

Let me close by affirming that despite the criticisms I have made of the current structure of the Union, I greatly admire and appreciate the hard work and dedication of all of the members of IUPAC. I have enjoyed my past work as a Commission member and all of my interactions with fellow chemists in the Union. I would like to thank the past officers, especially Professors Yves Jeannin, Anders Björkman, and Tom West for their advice and help during my term as Vice-President. I have enjoyed working with Professors Heinz Staab, Gerrit den Boef and John Ward during my presidential years and greatly appreciate their considerable contributions to the Union. Finally, I must acknowledge the assistance and guidance given by Dr Mo Williams, Ann Troughton, and others at the Secretariat in Oxford.

As IUPAC moves towards its 75th birthday next year it can be proud of its past accomplishments. However, science moves quickly and the very nature of chemistry is changing. IUPAC stands at the crossroads. Severe financial problems face even the most affluent societies and industries that we depend upon for our support. Important problems in science and technology exist that require a response from an international body like IUPAC. IUPAC must evolve to accommodate this new and changing environment.

News & Views

Thieme–IUPAC Prize in Synthetic Organic Chemistry

Thieme Publishers and IUPAC, in collaboration with the editors of *Synthesis*, *Synlett* and *Houben–Weyl* have announced the 1994 Thieme–IUPAC Prize in Synthetic Organic Chemistry sponsored by Goerg Thieme Verlag (Stuttgart and New York).

The **Thieme–IUPAC Prize** is presented every two years on the occasion of the IUPAC-sponsored International Conference on Organic Synthesis (ICOS). ICOS-94 will be held in Bangalore, India, on 11–16 December.

The prize of **DEM 10 000** is awarded to a scientist **under 40 years of age** (as of 1 January of the year in which the prize is awarded) whose research has had a major impact on the field of synthetic organic chemistry.

The first Thieme–IUPAC Prize was awarded in 1992 to Stuart L. Schreiber (Harvard, USA) for his outstanding achievements in the application of sophisticated chemical synthesis to crucial problems at the frontiers of molecular biology.

Call for nominations: deadline 15 April 1994

The prize will be awarded on the basis of scientific merit for independent research dealing with synthesis in the broadest context of organic chemistry, including organometallic and organoheteroatom chemistry, photochemistry, medicinal and biological chemistry, natural products, designed molecules, organic polymers and materials.

Proposals must be accompanied by a biographical sketch of the nominee, a list of the candidate's 10 most significant publications, and a statement of how the candidate's research has had a major impact on the field of synthetic organic chemistry.

Nomination materials (8 copies) should be submitted by 15 April 1994 to: The Executive Secretary, IUPAC Secretariat, Bank Court Chambers, 2–3 Pound Way, Templars Square, Cowley, Oxford OX4 3YF, UK. Tel: +44 (865) 747744. Fax: +44 (865) 747510. Telex: 83147 VIA OR G, attn. IUPAC. Telegrams: IUPAC OXFORD. E-mail: IUPAC@VAX.OX-FORD. AC.UK.

Chilled chemists

English is a curious language at the best of times. Take the pronunciations of 'ch' in the two words in the title of this piece for example. If the pronunciations were the same we might hear 'killed chemists'. It is no wonder, therefore, that numerous people, including native English speakers, have difficulty with the tongue and are therefore prone to make mistakes in both speech and writing.

Many people, including some chemistry editors, take great delight in spotting these errors and drawing attention

to them. Robert Schoenfeld, one of the most celebrated of editors, entertained his readers with some hilarious examples in his book *The Chemist's English*. Here are two of my favourites:

- '*Given* the enormous procreative power of the rabbit, the *investigators* decided to broaden the scope of their experiments.'
- 'After *standing* in the refrigerator overnight, *we* filtered off the acid.'

The Chemists's English *(Second, revised edition) by Robert Schoenfeld. VCH Publishers, Weinheim, Federal Republic of Germany, 1986. 176 pp. ISBN 3-527-26597-X (VCH Verlagsgesellschaft); 0-89573-599-7 (VCH Publishers).*

The Centre for Our Common Future

For the past 5 years, the Center for Our Common Future in Geneva has dedicated itself to promoting worldwide the concept of sustainable development. The Centre's information exchange activities aim to help organizations and individuals alike, and for many in developing countries, the Centre's publications are the most accessible and comprehensive sources on sustainable development initiatives undertaken by international and intergovernmental organizations, governments, the United Nations, and other members of the independent sectors.

The Centre is committed to providing publications and services at no cost to those who do not have the means to pay, particularly organizations in the developing world. In order to do this the Centre needs help and is therefore inviting financial support through its 'Friend of the Centre' scheme. This programme will enable individuals and organizations in developing countries to receive its publications *The Bulletin* and *The Network* free of a charge. For a yearly contribution of USD 200 or more, a person or institution will become a 'Friend of the Centre' and receive both publications at no cost for one year.

For further information, please contact: The Centre for Our Common Future, 52, rue des Pâquis, 1201 Geneva, Switzerland. Tel: +41 (22) 732 71 17. Telex 412436 CSEN CH. Fax +41 (22) 738 50 46,

Affiliate Affairs

Spanish translations

A Spanish translation of the following IUPAC recommendations on nomenclature of organic chemistry has recently been published:

- Revision of the Extended Hantzsch–Widman System of Nomenclature for Heteromonocycles (Recommendations 1982). *Pure Appl. Chem.* **55**, 409–416 (1983). Prepared for publication by W. H. Powell.

The recommendations were translated by Prof. Eldiberto Fernández Alvarez and Francisco Fariña Pérez (both at Universidad Complutense, Ciudad Universitaria, Madrid) and published in Anales de Química, ***88, 590–595, 1992.***

Information for Affiliates

How to contact commissions

IUPAC affiliates are entitled to communicate directly on scientific matters with the officers of IUPAC commissions. A full list of names and addresses of all commission officers for 1994–95 is published on pages 215–227 of this issue of *CI*.

IUPAC-sponsored conferences

If you are interested in attending a conference please apply directly to the conference organizers for the conference circulars and registration forms. An updated list of names and addresses of the organizers of all future IUPAC-sponsored conferences is given in the 'Conference Calendar' published in each issue of *CI*.

Affiliate reduction of conference registration fees

It is a condition of IUPAC sponsorship of a conference that IUPAC affiliates are entitled to a 10% reduction or 'own members' rate on the registration fee for scientific participants. This concession is usually – but not always – announced in the conference circulars and indicated on the registration form.

To receive this reduction an affiliate must declare on the conference registration form that (s)he is an affiliate. Alternatively the affiliate should apply in writing to the conference organizer for this reduction stating that (s)he is an affiliate. Conference organizers may check with the IUPAC Secretariat that applicants for this reduction are currently registered as affiliates.

If an application for this reduction is refused, an affiliate should immediately notify the Affiliate Affairs Secretary and, if possible, forward copies of documentary evidence of this refusal

Address of IUPAC Secretariat

Please use the following address for all communications directed to the IUPAC Affiliate Affairs Secretary. If you are submitting a letter for publication in *Chemistry International* (*CI*), please indicate that the letter is 'Submitted for publication in *CI*.'

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E-mail: IUPAC@VAX.OXFORD.AC.UK.

IUPAC publications

Affiliates are entitled to a 25% reduction and in some cases a 40% reduction on the cost of IUPAC publications except the scientific journal *Pure and Applied Chemistry.* A leaflet detailing IUPAC books currently available from Blackwell Scientific Publications has recently been distributed by the publishers to all *CI* readers. Further copies may be obtained from the IUPAC Secretariat.

Ties and scarves

IUPAC ties and scarves may be purchased from the IUPAC Secretariat by applying to the Affiliate Affairs Secretary. The colours for both are *either* maroon *or* navy (dark) blue. The ties cost USD 14.00/GBP 7.00 each and the scarves USD 12.00/GBP 6.00 (including postage and packing).

Please use the form (or a photocopy of it) published on page 170 of the September 1992 issue of *CI.* Alternatively please write to the Affiliate Affairs Secretary with your order stating the colour you require. A cheque made payable to IUPAC for the appropriate amount should be enclosed with your order.

IUPAC poster

Copies of an IUPAC poster (see page 214 of the November 1990 issue of *CI*) are available **free of charge** to affiliates and members of IUPAC's commissions and committees. The poster is printed in maroon and black on a white background and is approximately 42 × 59 cm in size.

IUPAC welcomes any publicity you can give to its activities. If you would like to display one or more copies of the poster in your department or elsewhere please write to the Affiliate Affairs Secretary stating your name and address and how many copies of the poster you wish to receive.

IUPAC 1992

Maurice Williams

Each year, IUPAC Executive Secretary Dr Maurice Williams prepares a report on IUPAC activities for the International Council of Scientific Unions (ICSU). This is his 1992 report.

Introduction

For IUPAC, 1992 was a non-General Assembly year. The business of the Union was conducted through meetings of the Executive Committee (Dublin, April) and the Bureau (Oxford, September).

Cuba ceased to be a Member of the Union because of arrears in its annual subscription, and Russia became the first of the 15 states, which formerly comprised USSR, to take up membership of IUPAC. Peru changed its status to that of an Observer Country, and the Chemical Societies of Croatia, Mexico, Slovenia, and Vietnam, were also accepted for such status.

Following the impasse last year in the restructuring of IUPAC, a consensus was reached with the Division/Section Presidents regarding the future distribution of titular membership. This will facilitate greater flexibility with respect to existing bodies and in dealing with emerging areas of chemistry. All proposed projects should henceforth be of high scientific priority, and be prepared and subjected to external refereeing prior to the biennial General Assembly. Improvements have been introduced for reporting progress of on-going projects, and the compilation of detailed guidelines and a glossary should assist commission officers to supervise better the scientific work of the Union.

Publications

Despite the extreme difficulties then being faced within CIS, CHEMRAWN VIII – *World Conference on Chemistry and Sustainable Development: Towards a Clean Environment, Zero Waste, and Highest Energy Efficiency* – was held in Moscow during September, as an official follow-up to UNCED 92. The perspectives and recommendations booklet is scheduled for consideration at the Mendeleev Congress on *Environmental Problems of General and Applied Chemistry* (Minsk, May 1993). It is hoped to publish the technical proceedings as a monograph in the new series on *Chemistry for the 21st Century*.

Each monograph consists of review papers written by scientists of world renown from various countries, and outlines the perspectives of various fields of chemistry in opening up future horizons for science and technology. *Perspectives in Catalysis* has already been widely acclaimed, and the more recent monographs on *Chemistry and Advanced Materials* and on *Medicinal Chemistry for the 21st Century* are also expected to attract wide attention.

Another major series recently launched by IUPAC is that on *Environmental Analytical and Physical Chemistry*. Chemistry has a key role in environmental science, since it

CHEMRAWN VIII was held at the Hotel Uzkoye, Moscow.

The volume *Environmental Particles* contains critical reviews on sampling, characterization, and the role and behaviour of particles in the air, surface and ground waters, and sediments and soil.

deals with the basic reactions which underlie both the biological and geological processes. Progress will depend on the development of novel experimental methods and of rigorous approaches and new concepts to investigate relevant physicochemical processes. The first volume, *Environmental Particles*, contains critical reviews on sampling, characterization, and the role and behaviour of particles in the air, surface and ground waters, and sediments and soil.

Two other important publications in 1992 were:

Chemical Safety Matters – a concise review of the safe use and proper disposal of hazardous chemicals in laboratories, issued in conjunction with WHO's International Programme on Chemical Safety, UNEP, and ILO;

The first supplement to the 7th revised and enlarged edition (1987) of *Standard Methods for the Analysis of Oils, Fats, and Derivatives*.

Five more volumes appeared in the *Solubility Data Series*, bringing the total to 52 under a publishing contract with Pergamon Press, which has now been completed. Other arrangements are under investigation, in order to ensure the continued dissemination of this invaluable critically evaluated reference data.

Publication by IUPAC of the Phase (ii) report of the IUPAC–IUPAP Transfermium Working Group – *Introduction to Discovery Profiles and Discovery Profiles of the Transfermium Elements* – has been delayed, so that the laboratories in Berkeley, Darmstadt, and Dubna, may comment simultaneously on this highly controversial matter.

Thieme–IUPAC Prize

The initial Thieme–IUPAC Prize in Synthetic Organic Chemistry – for scientists under 40 years of age – was awarded to Prof. S. L. Schreiber (Harvard University). It recognized his development of entirely new synthetic methods and strategies for building up ring systems for the stereospecific generation of complex stereochemical arrays and for controlling absolute stereochemistry. Approaches are being made to other sources for additional IUPAC awards.

After receiving a position paper, dealing with making and breaking rules for the internal ethics of science, publication rules, ethical guidelines and codes of conduct, external ethical issues, and recommendations regarding activities of IUPAC in the area of ethics in chemistry, the Bureau confirmed that the Union should concern itself with ethical and even moral issues for chemists. A small subcommittee has been appointed to consider the matter further, particularly in respect of chemical research. This activity arose as a consequence of the article on *Ethics in Modern Science* in ICSU's *Science International*.

Regarding the 1992 ICSU grants to IUPAC, significant progress has been achieved in three major programmes to ensure Chemical Quality Assurance in such diverse areas as the environment, medicine, commerce, and industry. In particular, agreement has been reached on an *International Harmonized Protocol for Proficiency Testing of (Chemical) Analytical Laboratories*. Preparation of Vol. 3 in IUPAC's *Environmental Analytical and Physical Chemistry* series (see page 1), on *Metal Speciation and Bioavailability*, is at an advanced stage, and it should be of wide interest within ICSU. A highly successful workshop, in conjunction with the Thai Department of Agriculture, was held at Bangkok in November on *Assessment and Management of Risks from Pesticide Use in SE Asia*.

Appendix

The following nomenclature reports (IUPAC Recommendations 1992) were published during the year:

1 Commission on Biotechnology, 'Glossary for chemists of terms used in biotechnology', *Pure Appl. Chem.* **64**, 143–168 (1992)

2 Commission on Spectrochemical and Other Optical Procedures for Analysis, 'Nomenclature, symbols, units and their usage in spectrochemical analysis – XII. Terms related to electrothermal atomization', *Pure Appl. Chem.* **64**, 253–259 (1992)

3 Commission on Spectrochemical and Other Optical Procedures for Analysis, 'Nomenclature, symbols,

'The Union should concern itself with ethical and even moral issues for chemists'.

units and their usage in spectrochemical analysis – XIII. Terms related to chemical vapour generation', *Pure Appl. Chem.* **64**, 261–264 (1992)

4 Commission on Biotechnology, 'Selection of terms, symbols and units related to microbial processes', *Pure Appl. Chem.* **64**, 1047–1053 (1992)

5 Commission on Quantities and Units in Clinical Chemistry, 'Quantities and units for metabolic processes as a function of time', *Pure Appl. Chem.* **64**, 1569–1575 (1992)

The following technical reports by IUPAC bodies were published during the year:

1 Commission on Biotechnology, 'Interrelations of chemistry and biotechnology – III. Purification techniques for biological products', *Pure Appl. Chem.* **64**, 169–184 (1992)

2 Commission on General Aspects of Analytical Chemistry, 'Present and future status of organic analytical reagents – IV. Organic analytical reagents in atomic absorption spectrophotometry of metals', *Pure Appl. Chem.* **64**, 213–226 (1992)

3 Commission on Microchemical Techniques and Trace Analysis, 'A critical survey of hydride generation techniques in atomic spectroscopy', *Pure Appl. Chem.* **64**, 227–244 (1992)

4 Commission on Microchemical Techniques and Trace Analysis, 'Preparation of biological samples for ion microscopy', *Pure Appl. Chem.* **64**, 245–252 (1992)

5 Commission on Physical Organic Chemistry, 'A critical compilation of physical properties of short-lived intermediates: Carbenes and carbene analogues', *Pure Appl. Chem.* **64**, 265–314 (1992)

6 Commission on Oils, Fats and Derivatives, 'Determination of the phospholipid profile of lecithins by high performance liquid chromatography: Results of a collaborative study and the standardized method', *Pure Appl. Chem.* **64**, 447–454 (1992)

7 Commission on Microchemical Techniques and Trace Analysis, 'Preparation and certification of ion–implanted reference materials: A critical review', *Pure Appl. Chem.* **64**, 545–574 (1992)

8 Commission on Microchemical Techniques and Trace Analysis, 'Determination of arsenic species in environmental and biological samples', *Pure Appl. Chem.* **64**, 575–590 (1992)

9 Commission on Microchemical Techniques and Trace Analysis, 'Laser ionization of sputtered atoms: Trace analysis of samples with atomic dimensions', *Pure Appl. Chem.* **64**, 591–598 (1992)

10 Commission on Toxicology, 'Cooperative study on measurement of concentrations of selenium in freeze-dried (human whole) blood', *Pure Appl. Chem.* **64**, 765–780 (1992)

11 Commission on Atomic Weights and Isotopic Abundances, 'Reporting of nitrogen-isotope abundances', *Pure Appl. Chem.* **64**, 907–908 (1992)

12 Commission on Physical Organic Chemistry, 'Guidelines for the publication of research in experimental organic chemistry', *Pure Appl. Chem.* **64**, 989–990 (1992)

13 Commission on Microchemical Techniques and Trace Analysis, 'A critical review of nuclear activation techniques for the determination of trace elements in atmospheric aerosols, particulates and sludge samples', *Pure Appl. Chem.* **64**, 991–1014 (1992)

14 Commission on Electroanalytical Chemistry, 'Reactant adsorption in analytical pulse voltammetry: Methodology and recommendations', *Pure Appl. Chem.* **64**, 1015–1028 (1992)

15 Commission on Food Chemistry, 'Ochratoxin A: A review', *Pure Appl. Chem.* **64**, 1029–1046 (1992)

16 Commission on Physical Organic Chemistry, 'Guidelines for the presentation of quantum mechanical computational data in organic chemistry', *Pure Appl. Chem.* **64**, 1203–1209 (1992)

17 Commission on Photochemistry, 'A collection of experiments for teaching photochemistry', *Pure Appl. Chem.* **64**, 1343–1382 (1992)

18 Commission on Atomic Weights and Isotopic Abundances, 'Atomic weights of the elements 1991', *Pure Appl. Chem.* **64**, 1519–1534 (1992)

19 Commission on Atomic Weights and Isotopic Abundances, 'Atomic weight: The name, its history, definition, and units', *Pure Appl. Chem.* **64**, 1535–1543 (1992)

20 Commission on Thermodynamics, 'Conversion of temperatures and thermodynamic properties to the basis of the International Temperature Scale of 1990', *Pure Appl. Chem.* **64**, 1545–1562 (1992)

21 Commission on Polymer Characterization and Properties, 'Consistent values of rate parameters in free radical polymerization systems', *Pure Appl. Chem.* **64**, 1563–1567 (1992)

22 Commission on Polymer Characterization and Properties, 'Characterization of the cure of resins by differential scanning calorimetry', *Pure Appl. Chem.* **64**, 1789–1800 (1992)

23 Commission on Polymer Characterization and Properties, 'Intrinsic characterization of continuous fibre thermoplastic composites – II. Pseudo-elastic constants for aromatic polymer composite (APC–2)', *Pure Appl. Chem.* **64**, 1801–1808 (1992)

24 Commission on Polymer Characterzation and Properties, 'Aging effects in 16 years on mechanical properties of commercial polymers', *Pure Appl. Chem.* **64**, 1945–1958 (1992)

25 Commissions on Food Chemistry and Oils, Fats and Derivatives, 'An assessment of lipid oxidation in foods', *Pure Appl. Chem.* **64**, 1959–1964 (1992)

26 Commission on Agrochemicals, 'Pesticides report 29: Appraisal of the fate of agrochemicals in plants and soil: A cost-effective integrated approach', *Pure Appl. Chem.* **64**, 1965–1976 (1992)

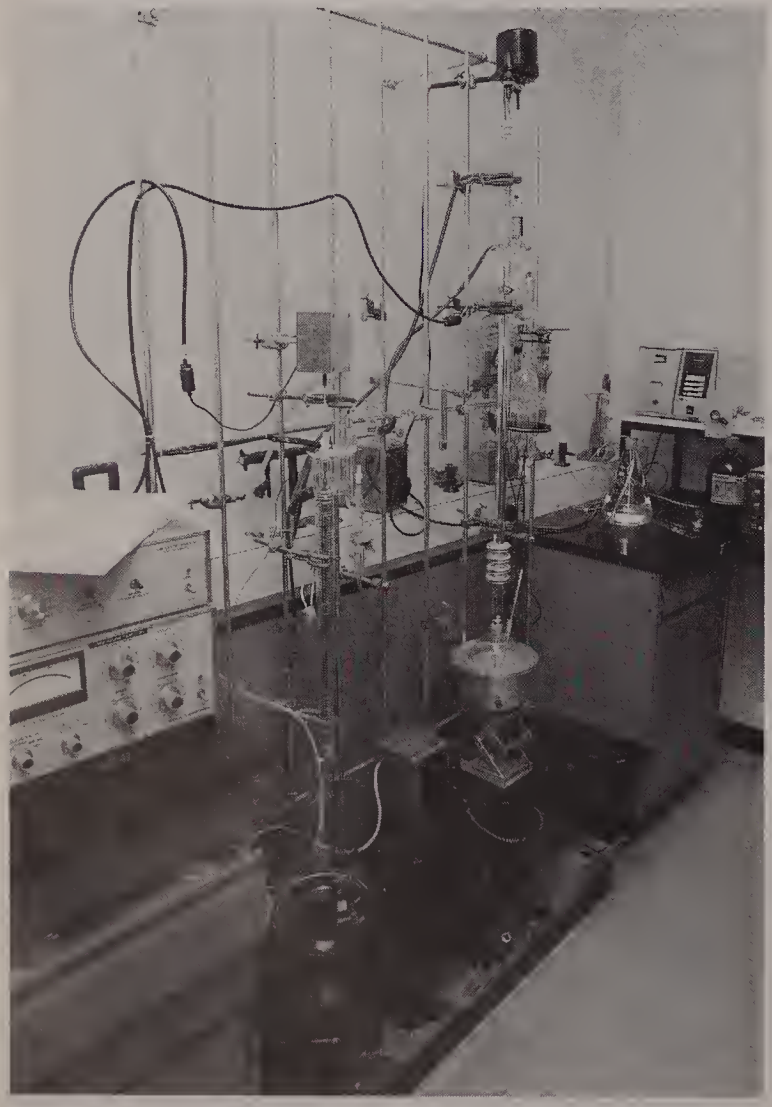
27 Commission on Solubility Data, Solubility Data Series: Volume 48, *Esters with Water – I: Esters 2-C to 6-C* (published in book form by Pergamon Press, Oxford, 1992)

28 Commission on Solubility Data, Solubility Data Series: Volume 49, *Esters with Water – II: Esters 7-C to 32-C* (published in book form by Pergamon Press, Oxford, 1992)

29 Commission on Solubility Data, Solubility Data Series: Volume 50, *Carbon Dioxide in Non-aqueous Solvents at Pressures less than 200 KPA* (published in book form by Pergamon Press, Oxford, 1992)

30 Commission on Solubility Data, Solubility Data Series: Volume 51, *Intermetallic Compounds in Mercury* (published in book form by Pergamon Press, Oxford, 1992)

31 Commission on Solubility Data, Solubility Data Series: Volume 52, *Alkaline Earth Hydroxides in Water and Aqueous Solutions* (published in book form by Pergamon Press, Oxford, 1992)



The Commission on Physical Organic Chemistry, has published 'Guidelines for the publication of research in experimental organic chemistry'.

32 Commission on Oils, Fats and Derivatives, 1st Supplement to 7th edn. of *Standard Methods for the Analysis of Oils, Fats, and Derivatives* (published in book form by Blackwell Scientific Publications, Oxford, 1992)

33 Committee on Publications, *Perspectives in Catalysis* (published as a 'Chemistry for the 21st Century Monograph' by Blackwell Scientific Publications, Oxford, 1992)

34 Committee on Publications, *Medicinal Chemistry for the 21st Century* (published as a 'Chemistry for the 21st Century Monograph' by Blackwell Scientific Publications, Oxford, 1992)

35 Committee on Publications, *Chemistry of Advanced Materials* (published as a 'Chemistry for the 21st Century Monograph' by Blackwell Scientific Publications, Oxford, 1992)

36 Commission on Environmental Analytical Chemistry, Environmental Analytical and Physical Chemistry Series : Volume 1, *Environmental Particles* (published in book form by Lewis Publishers, Boca Raton, 1992)

37 IUPAC – WHO International Programme on Chemical Safety, *Chemical Safety Matters* (published in book form by Cambridge University Press, UK, 1992)

Thirty-seven symposia were sponsored by IUPAC in 1992, namely:

1 6–9 January 1992. International Symposium on Enzymes in Organic Synthesis, New Delhi, India. [*Pure Appl. Chem.* **64**, (8) 1992].

2 22–24 April 1992. Centenary of Geneva Conference – Organic Chemistry: Its Language and its State of the Art, Geneva, Switzerland. (Proceedings to be published by Verlag Helvetica Chimica Acta, Basle, 1993).

3 11–14 May 1992. 5th International Symposium on Biological and Environmental Reference Materials, Aachen, Germany. (Proceedings to be published in *Fresenius' Zeitschrift für Analytische Chemie*, 1993).

4 15–19 May 1992. International Conference on Calorimetry and Thermodynamics of Biological Processes, Göteborg, Gullmarsstrand, Sweden. (Main lectures to be published in *Pure Appl. Chem.*, 1993).

5 7–12 June 1992. 3rd International Conference on Heteroatom Chemistry, Riccione, Italy. [*Pure Appl. Chem.*, **65**, (4) 1993].

6 21–26 June 1992. 14th International Liquid Crystal Conference, Pisa, Italy. (Proceedings to be published by Taylor & Francis, London, 1993).

7 28 June – 2 July 1992. 9th International Conference on Organic Synthesis, Montréal, Canada. [*Pure Appl. Chem.* **64**, (12) 1992].

8 29 June – 3 July 1992. 2nd International Symposium on Surface Chemistry, Adsorption and Chromatography, Moscow, Russia. (Main lectures to be published in *Pure Appl. Chem.*, 1993).

9 5–10 July 1992. 16th International Carbohydrate Symposium, Paris, France. [*Pure Appl. Chem.*, **65**, (4) 1993].

10 7–11 July 1992. International Symposium on Ring-opening Polymerization, Warsaw, Poland. (Proceedings to be published as a volume in the Macromolecular Symposia series to the journal *Die*

The 10th International Carbohydrate Symposium was held in Paris.

Makromolekulare Chemie by Hüthig & Wepf Verlag, Basel, 1993).

11 8–10 July 1992. 5th International Symposium on Solubility Phenomena, Moscow, Russia. [*Pure Appl. Chem.*, **65**, (2) 1993].

12 12–17 July 1992. 10th International Conference on Computers in Chemical Research and Education, Jerusalem, Israel. [*Pure Appl. Chem.*, **65**, (2) 1993].

13 13–16 July 1992. International Conference on 'Risk Management of Chemicals – Can Chemicals be used Safely ?', Guildford, UK. (Published as *Risk Management of Chemicals* by Royal Society of Chemistry, Cambridge, 1992).

14 13–18 July 1992. 34th International Symposium on Macromolecules, Prague, Czechoslovakia. ((Proceedings to be published as a volume in the Macromolecular Symposia series to the journal *Die Makromolekulare Chemie* by Hüthig & Wepf Verlag, Basel, 1993).

15 17–19 July 1992. International Conference on Chemistry, Agriculture and the Environment, Guildford, UK. (Published as *Chemistry, Agriculture and the Environment* by Royal Society of Chemistry, Cambridge, 1992).

16 19–24 July 1992. 29th International Conference on Coordination Chemistry, Lausanne, Switzerland. [*Pure Appl. Chem.* **64**, (10) 1992].

17 19–24 July 1992. 7th International Symposium on Novel Aromatic Compounds, Victoria, Canada. [*Pure Appl. Chem.*, **65**, (1) 1993].

18 19–25 July 1992. 14th International Symposium on Photochemistry, Leuven, Belgium. [*Pure Appl. Chem.* **64**, (9) 1992].

19 2–7 August 1992. 11th International Conference on Physical Organic Chemistry, Ithaca, NY, USA. (Main lectures to be published in *Pure Appl. Chem.*, 1993).

20 2–7 August 1992. 3rd International Symposium on Analytical Chemistry in the Exploration, Mining and Processing of Materials, Sandton, South Africa. (Main lectures to be published in *Pure Appl. Chem.*, 1993).

21 9–14 August 1992. 17th International Symposium on Macrocyclic Chemistry, Provo, Utah, USA. [*Pure Appl. Chem.*, **65**, (3) 1993].

22 16–21 August 1992. 12th IUPAC Conference on Chemical Thermodynamics, Snowbird, Utah, USA. [*Pure Appl. Chem.*, **65**, (5) 1993].

23 16–21 August 1992. 9th International Biotechnology Symposium, Crystal City, VA, USA. (Published as *Harnessing Biotechnology for the 21st Century* by American Chemical Society, Washington, 1992).

24 18–22 August 1992. 4th International Seminar on Flame Structure, Novosibirsk, Russia. [*Pure Appl. Chem.*, **65**, (2) 1993].

25 30 August – 4 September 1992. 18th International Symposium on Chemistry of Natural Products, Strasbourg, France. [*Pure Appl. Chem.*, **65**, (6) 1993].

26 31 August – 4 September 1992. 13th International Conference on Raman Spectroscopy, Würzburg, Germany. (Proceedings to be published by John Wiley, New York, 1993).

27 6–9 September 1992. CHEMRAWN VIII: Chemistry and Sustainable Development – Towards a Clean Environment, Zero Waste and Highest Energy Efficiency. Moscow, Russia. (Proceedings to be published as a 'Chemistry for the 21st Century Monograph' by Blackwell Scientific Publications, Oxford, 1994).

28 7–11 September 1992. 9th European Symposium on Structure–Activity Relationships: QSAR and Molecular Modelling, Strasbourg, France. (Proceedings to be published by Escom Publishing Co., Leiden, 1993).

29 7–11 September 1992. 5th International Conference on Nickel Biochemistry, Toxicology and Ecological Issues, Sudbury, Ontario, Canada. (Proceedings to be published in the journal *Science of the Total Environment* by Elsevier, Amsterdam, 1993).

30 13–15 September 1992. International Symposium on Macrocyclic Ligands for the Design of New Materials, Guildford, UK. [*Pure Appl. Chem.*, **65**, (7) 1993].

31 13–17 September 1992. 12th International Symposium on Medicinal Chemistry, Basel, Switzerland. (Proceedings to be published by Verlag Helvetica Chimica Acta, Basle, 1993).

32 14–17 September 1992. International Conference on Organic Substances in Soil and Water, Lancaster, UK. (Proceedings to be published by Royal Society of Chemistry, Cambridge, 1993).

33 20–26 September 1992. SAC 92: International Confereence on Analytical Chemistry, Reading, UK. (Proceedings to be published in *The Analyst*, 1993).

34 26 September – 1 October 1992. International Symposium on Experimental and Theoretical Aspects of Excited State Electron Transfer and Related Phenomena, Pultusk, Poland. [*Pure Appl. Chem.*, **65**, (8) 1993].

35 29 September – 2 October 1992. 10th European Symposium on Polymer Spectroscopy, St. Petersburg, Russia. (Proceedings to be published as a volume in the Macromolecular Symposia series to the journal *Die Makromolekulare Chemie* by Hüthig & Wepf Verlag, Basel, 1993).

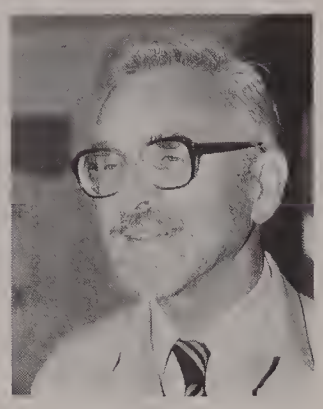
36 8–12 November 1992. 8th International Symposium on Mycotoxins and Phycotoxins, Mexico City, Mexico. (No publication is expected to arise from this meeting).

37 17–21 December 1992. 12th International Conference on Chemical Education, Bangkok, Thailand. (Proceedings to be published by the Chemical Society of Thailand, Bangkok, 1993).

Biennial Report of the Treasurer and Finance Committee

This is the text of the Biennial Report of the Treasurer and Finance Committee for 1991–92 presented by the Treasurer, Prof. John Ward to Council at the 37th IUPAC General Assembly held in Lisbon, Portugal.

Prof. John Ward.



I succeeded Prof. Anders Björkman in January 1992, so that this report covers a year of Prof. Björkman's stewardship and a year of mine - although it was my responsibility to comment on both years, when the accounts were published in *CI* in September 1992 and in July 1993. In addition, I have been accorded the responsibility of continuing to chair the Finance Committee, so that the present report is very much a combined one. I shall first summarize the main points of the accounts for the two years, and I shall draw some general conclusions. Secondly, I shall deal with our investments and conclude with a statement about our reserves.

1991 and 1992 Accounts

I hope that the new format, which now conforms with accepted international practice, makes the accounts easier to follow, and that you find useful the Comparative Balance Sheet on the first page. In summary, the final bottom lines for the two years compared with budgets are:

	Actual	Budget
1991	(161 602)	(194 000)
1992	(72 390)	0
Total	(233 992)	(194 000)

Note. Brackets denote deficits.

But for adopting a new convention recommended by our auditors, the actual deficit for 1991 would have been USD 265 515 which, it could be argued, should be the figure to compare with budget. I discussed this point fully in my comments to the 1991 accounts in *CI*, and I shall not pursue it here.

At Hamburg in 1991 I presented financial forecasts by the Finance Committee, which showed that heavy deficits were likely to follow in the next two biennia, and that unless decisive action was taken, we should run up a deficit by 1995 of about one million US-dollars. As a result, Council agreed substantial cuts in expenditure and an increase in subscriptions of 5% in each of the years 1992 and 1993, to give a balanced budget for 1992 and a deficit of USD 52 000 for 1993. A first reading of the 1992 accounts, showing a deficit of USD 72 390, leads to the conclusion that Council's intention has not been realized and not by a substantial amount. In fact, it is not quite so. Unfortunately, when the 1992 and 1993 budgets were cast, two items of expenditure were omitted, depreciation of our fixed assets and provision of *CI* for members. At the same time two items of income, grants from ICSU and contributions from the UK Royal Society, should have been omitted in conformity with the new accounts format, since these two sums were given for specific purposes. Together these errors meant that the 1992 budget was not balanced, but was in deficit by USD 54 913. The departure of the actual figure from budget is then only USD 17 477, an overspend of about 2% turnover.

The principle component of the USD 17 477 is a shortfall of USD 22 454 in interest and dividends from our invested reserves, which is partly offset by a small net gain in the compounded over-and under-spends of the other components. The shortfall in interest and dividends is principally the result of the lower returns from financial markets worldwide, but it is also the result of the interest and dividends from that part of our reserves set aside as a Building Fund accruing to that fund. Nevertheless, the Building Fund is part of our total reserves, and the interest and dividends from it could be looked upon as providing most of the money needed to meet the USD 17 477 departure from the budget. It is good to note that, in spite of the year being a difficult one for publication businesses, the surplus on the publications account has made up for the low return in 1991, and is at the level achieved in previous years. We should note too that IUPAC publications bring an important contribution to our income, in spite of having to bear part of the costs of *CI* and other publicity.

Regrettably and ominously, the causes of the inbuilt deficit in the 1992 budget also affect the 1993 budget, which now carries a deficit of about USD 100 000 rather than the agreed USD 52 000. It also means that we shall carry an expenditure of about USD 50 000 more in 1994 and 1995 budgets under Council agenda item 19, but clearly we shall need to continue the kind of decisive action taken in Hamburg.

The need to increase income

If we are to balance our budgets we can continue to cut our expenditure, reducing even further the money available for the Union's scientific work, but the more positive approach is to increase our income. The Union must be much more vigorous in doing this. Even in the years when we were

making a surplus, the Union was underfunded and only achieved its results by the sterling effort of its Members in raising money from outside, Our attitude towards income can only be regarded as lax. Council has seemed to increase subscriptions only with great reluctance, and it has often turned down recommendations by the Bureau, Treasurer, and Finance Committee. Even when subscription levels have been agreed, payment by most countries is far too tardy, particularly so in 1992. At the end of the first six months of 1992 only 22% of total subscriptions had been paid, after nine months 52%, and 63% at the end of November. This year the figure at six months is 44%, which is slightly better than in 1992, and I am grateful to those countries which have acted in response to my appeal when sending out the subscription invoices for 1993.

Such tardy paying would not be tolerated in most national scientific organisations, which commonly bring in sanctions against non-payers at the end of three months. I strongly recommend that our regulations about late payment should be tightened. It is not a case of obeying regulations imposed from above, but improving 'housekeeping' for the benefit of all parts of the Union and its scientific work. If subscriptions were paid on 1st January when they are due, we could gain income by earning interest on the money until it was required, As it is, we had to sell investments and thus lose interest, to provide the necessary money mid-year in 1992. It requires all sources of funding to be persuaded or bullied into paying promptly. Obviously, no organisation wished to pay up until it has to pay, for it too wished to earn interest for as long as possible. Those responsible in our National Adhering Organisations must press for payment to be made, difficult though this is, and not sit back and wait for the money to arrive.

Preparations are being made for an approach to the chemical industries, in which the value of our work will be highlighted, a value many times the money which they presently put into the Union. The right timing of the approach is essential, however, and must await the emergence of industry from the present universal recession.

Whatever means we use to raise our income, it is obvious that we must use our resources as economically and efficiently as possible. We are now producing quarterly management accounts as well as monthly accounts for the Secretariat to help us in this work. We are also helped by suggestions and recommendations from our assiduous internal auditor, Dr Stanley Brown. As you will know only too well, I have had to be both parsimonious and strict about subsistence and travel expenses. I wish it could be otherwise, particularly as I realise that more than half of the monies needed for our scientific work come through the praiseworthy and rigorous fund-raising efforts of our Members. As a comparative newcomer to the Union, who is used to the more affluent situation of a natural chemical society, I am both surprised and impressed by their resourcefulness and dedication and, as Treasurer, I am grateful for them.

Resources and investments

The principal task of the Finance Committee is to look after our investments, although it acts as a most efficient sounding board and source of advice to the Treasurer on all financial matters. 1992 was the first year in which our banker, the Union Bank of Switzerland, managed our portfolio of investments. It was a difficult year for money markets worldwide and particularly for US dollar-based accounts. Even so the Finance Committee found that total return on our main investment account of 3.64% disappointing. The Building Fund invested in UK bonds and shares fared much better with a total return of 15.83%. The Committee is investigating the possibilities of using a smaller investment company, which is more used to dealing with our type of organization.

Despite the difficulties we are having in balancing our resources against our aspirations on a running basis, our reserves remain strong. They went from USD 2 173 113 in 1991 to USD 2 472 457 in 1992, an increase of nearly 14%. However, because our expenses were heavier than income, the amount by which our reserves exceed the agreed level (the sum of the expenditure for the two previous years), was only USD 32 363, 1.3% of total reserves. This amount could reasonably be set against the USD 72 390 shortfall in the 1992 accounts. However, let me again warn against planning to use reserves to offset deficits in the current accounts. To do so would take us further and further away form financial equilibrium until, when the reserves were used up or even reduced to half their present level, the Union would be in a financially irretrievable position.

Conferences

High-temperature materials chemistry Vienna, Austria 4–9 April 1994

The 8th International Conference on High Temperature Materials Chemistry (HTMC VIII) will be organised by the Institute of Inorganic Chemistry of the University of Vienna, the Austrian Chemical Society and the Institute of Chemical Technology of Inorganic Materials of the Technical University of Vienna. It will be held at the Technical University.

The aim of HTMC VIII is to provide up-to-date coverage on advanced materials used or prepared at high temperatures. Various methods of synthesis and measurements will be discussed as well as properties of inorganic–metallic and ceramic-materials related to high temperature applications.

Special attention will be paid to the following rapidly developing areas of research:

- Advanced materials for high temperature applications;
- New ceramic materials;
- Thermodynamics and kinetics at high temperatures;
- Modelling and databases;
- New measurement techniques;
- Materials under extreme environmental conditions.

The scientific programme will include lectures, poster contributions and the following ten plenary lectures:

- Interfacial stabilities of high temperature composite materials: Austin Y. Chang (USA);
- Advanced materials for high temperature applications: J. C. Gachon (France);
- Superhard coatings for tool and wear applications based on the low-pressure CVD synthesis: Benno Lux (Austria);
- Oxidation of oxynitride ceramics: R. Metselaar (Netherlands);
- Thermochemistry of perovskite-related oxides with high oxidation states – Superconductors, sensors, fuel cell materials: Alexandra Navrotsky (USA);
- Tailoring microstructures of silicon nitride ceramics: Günter Petzow (Germany);
- Chemical approaches to the design of oxide materials C. N. R. Rao (India);
- Diamond-like carbon: John Robertson (UK);
- High temperature chemistry of CVD diamond growth: Karl Spear (USA);
- Design and self-diagnosis function in materials: Hiroaki Yanagida (Japan).

The plenary lectures will be published in *Pure Appl. Chem.*

The language of the conference will be English. The registration fees are ATS 2500.- and, for students, ATS 1500.-. The fee covers admission to all scientific sessions, an abstract book, a welcome party and a reception by the Mayor of the City of Vienna. Hotel accommodation is available at rates ranging from ATS 400.- to ATS 1200.- and should be booked in advance through a travel agency. The social programme will include an excursion to a baroque monastery with the conference dinner in an old castle. For those staying to the end of the conference and with enough energy left, there will be a visit to 'Heurigen' on Saturday.

The city of Vienna, with a population of 1.7 million, is situated in the centre of Europe on the Blue Danube (the river is actually green–grey but after the visit to the Heurigen it may well seem blue). It is a town with a long history. The Romans built a fortress there and called it Vindobona. Since Vienna was the capital of the Hapsburg Empire, which covered most of central Europe, it has many famous and well-preserved castles and palaces such as Schönbrunn and the Hofburg where the Spanish Riding School has its home. There are also many churches, the most famous being St

IUPAC affiliate Karl Spear will present a lecture on 'High temperature chemistry of CVD diamond growth' at HTMC VIII.

Vienna.

Stephans which originated in the 14th century. There are also modern buildings, for example the Adolf Loos Haus and the Hundertwasser Haus. The latter, which looks like a fairytale castle, was constructed by the painter Hundertwasser and financed by the city government.

Vienna is known as the city of music. Many famous musicians were born or lived a great part of their lives in the city: Mozart, Beethoven, Schubert, Strauss, Schönberg and Webern. The tradition is still alive and one can enjoy different types of music ranging from well-known operas to musicals, classical concerts, modern music and jazz.

There are more than thirty different museums in Vienna ranging from the famous 'Kunsthistorische Museum' (Museum of Fine Arts) to the small Undertakers Museum.

The University of Vienna, which is over 625 years old, was founded by Duke Rudolf IV in 1365 and is called Alma Mater Rudolphina. By 1400 about 4000 students were enrolled. During the reign of Maria Theresia a new building in the baroque style was built inside the city wall.

Today, the University is the seat of the Austrian Academy of Science. In 1878, women were accepted as guest students and it took almost 20 more years before they could become regular students at the Faculty of Philosophy. As student numbers increased it became necessary to build a larger campus – which was done after the city walls were torn down in the middle of the 19th century to make way for the famous Ring-Straße. One of the major attractions is the main building of the University of Vienna which was opened in 1884. During World War II, 35% of the University's buildings were destroyed. Reconstruction began immediately after the war. The student body at that time numbered 4200. Today, the University of Vienna has 8 Faculties with 85 000 students from over 120 countries.

Chemistry does not have such a long tradition at the University. The first Professor of Chemistry, in 1849, was Prof. Redtenbacher at the Faculty of Medicine. Soon after, chemistry, mineralogy, zoology and botany joined the ranks of the Faculty of Philosophy. Redtenbacher had a small laboratory and then, after a long struggle with bureaucracy, a large laboratory was constructed near the main building. It is still used by the Department of Pharmacy. In the years 1869–70, 590 students attended chemistry lectures and 360 participated in laboratory courses. This large number of students was taught by one professor with one assistant. From 1914 to 1919, the so-called 'Neue Chemie' was built – a building in which the Institute is located today.

Many world famous scientists have studied or lectured at the University of Vienna. These include: Loschmidt, Boltzmann, Pauli, Schrödinger and Perutz and in the field of high temperature chemistry, Nowotny and Kieffer.

The International Conferences on High Temperature Materials Chemistry have a much shorter history. Since high temperature materials became increasingly important, two series of conferences were organized by the Commission of High Temperature and Solid State Chemistry (II.3) under the sponsorship of IUPAC. The first series started with a conference in Asilomar, USA, in 1963. The first conference of the second series was held in Odeillo, France.

Adolf Mikula

Chemistry and the brain

Two years ago, the international foundation 'Fondation de la Maison de la Chimie' in Paris, launched a series of scientific conferences focusing on the role of chemistry in science, technology and our everyday life. The next conference in this series will be held on Wednesday 24 November 1993 at 14.00 hours, at 'La Maison de la Chimie' in Paris, 28 rue Saint-Dominique, Paris 7. The topic will be 'Chemistry and the brain'. The conference will close with a round-table conference on the role of NO as one of the most important messengers in brain chemistry.

Further information from: Secretariat de la Fondation de la Maison de la Chimie, 28 rue Saint-Dominique, 75341 Paris Cedex 07, France. Fax: +33 (1) 45 55 98 62.

Microbial corrosion

The 3rd European Federation of Corrosion Workshop on Microbial Corrosion will be held at Hotel Palacio, Estoril, Portugal, on 13–16 March 1994. The workshop will cover all aspects of microbial corrosion in natural and industrial environments. The aim is to promote the exchange of information and ideas between research and industry and to provide a forum for people dealing with this problem from around the world.

The workshop topics will include: fundamental studies; bacterial processes; diffusivity of biofilms; monitoring; preventative measures; ecological aspects.

For further information please contact one of the following: (1) César Sequeira, Instituto Superior Técnico, Av. Rovisco Pais, 1096 Lisboa Codex, Portugal. (2) A. K. Tiller, Corrosion Centre, 23 Grosvenor Gardens, Kingston upon Thames KT25 BE, UK. (3) D. Thierry, Swedish Corrosion Institute, Oslagsvägen 101, Hus 25, S-10405 Stockholm, Sweden.

Near infrared spectroscopy

The 6th International Conference on Near Infrared Spectroscopy will be held at the Cumberland Conference and Leisure resort, Lorne, Victoria, Australia, from 18 to 22 April 1994. NIR-94 is the first conference in this series to be held in the southern hemisphere, and will focus on current and future directions in the theory and practice of NIR spectroscopy, particularly its impact on agriculture, industry, medicine and the environment. The theme of the conference, 'Leaping ahead', portrays the rapid progress in NIR technology. The conference will also feature workshops and a comprehensive exhibition of NIR hardware and software.

For further information please contact: NIR-94, Pastoral and Veterinary Institute, Mt. Napier Road, Private Bag 105, Hamilton, Victoria 3300, Australia. Tel: +61 (55) 73 0915. Fax: +61 (55) 71 1523.

Biological and environmental reference materials

The 6th International Symposium on Biological and Environmental Reference Materials (BERM-6) will be held from 17–21 April 1994 at the King Kamehameha Kona Beach Hotel, Kailua-Kona, Hawaii.

The major aim of this symposium series is to bring together effects in the production, study and use of reference materials in the analytical, biological, biomedical, clinical, environmental, and nutritional communities.

Further information from: (a) Dr Wayne R. Wolf, BERM-6, Standard Reference Materials Program, Bldg 202, Room 211, National Institute of Standards and Technology, Gaithersburg, MD 20899, USA. Tel: +1 (301) 504 8927. Fax: +1 (301) 504 8314. (b) Dr Markus Stoeppler, KFA, IPC Postfach 1913, D-5170, Julich, Germany. Tel: +49 (2461) 61 3179 (KFA), +49 (2461) 7468 (private). Fax: +49 (2461) 59834.

The quest for a healthier environment

The 14th International CODATA Conference on Data and Knowledge in a Changing World: The Quest for a Healthier Environment will be held on 18–22 September 1994 in Chambéry, France, at the Centre des Congrès 'Le Manège', Centre Malraux and the Mediathèque.

The conference will be organized around sessions in the area of scientific and technical data challenges in the traditional sections of industry, physics and chemistry as well as bio, geo- and space sciences. International and national mission-oriented institutions, agencies and scientific societies are collaborating in its organization.

To provide an appropriate framework for discussion the Conference will be centred around three main symposia:

- Environment and toxicity
- Materials and Thermodynamics
- Computer Aided Data Systems and Communication.

CODATA, the Committee on Data for Science and Technology, is an interdisciplinary scientific committee of the International Council of Scientific Unions. It seeks to improve the quality, reliability, management and accessibility of data of importance to all fields of science and technology.

Further information: (a) on CODATA from Mme. P. Glaeser, Executive Director, CODAT Secretariat, 51 Boulevard de Montmorency, 75016 Paris, France. Tel: +33 (1) 45250496. Fax: +33 (1) 4288166. (b) on 14th International CODATA Conference from Prof. Jacques-Emile Dubois, ITODYS, Université Paris 7, 1 rue Guy de la Brosse, 75005 Paris, France.

Acid reign

No, this is not a typical editorial error nor a typographical error. 'Acid reign '95' is the title of the first circular announcing the 5th International Conference on Acidic Deposition: Science and Policy to be held in Gothenburg, Sweden, on 26–30 June 1995.

The circular poses the question 'Will acid rain reign in 1995?' and points out that many of the early findings on acid rain were made in the Gothenburg and Swedish west coast region. In 1967 fishing superintendent Ulf Lundén made observations which then led to the alarming report by Prof. Svante Odén. Early observations on biological effects from acidification as well as on long range transport of air pollutants were also made on the Swedish west coast.

During recent years Gothenburg and the Swedish west coast have been a centre for research on acidification and other regional air pollution problems as well as a subject for extensive operational liming of lakes and streams. Projects and investigations of importance are the Lake Gårdjö project, field experiments on ozone damage to forest trees, investigations on long range transport of pollutants and studies of the relation between nutrient and water status and air pollution stresses. The conference will organize excursions to these project sites.

The Swedish west coast: will acid rain reign in 1995?

The Gothenburg Conference will cover the following scientific themes:

- Atmospheric transport, transformation and deposition of acidifying and related substances;
- Pathways and effects of acidifying and related substances;
- Direct effects of ozone and other regional air pollutants on terrestrial ecosystems;
- Reversibility and effects of countermeasures.

For further information write to: Acid Reign '95, Swedish Exhibition Center, Svenska Mässan, Box 5222, S-402 24 Gothenburg, Sweden.

Conference Calendar

Conference circulars and registrations forms for the IUPAC-sponsored conferences listed below may be obtained, upon request, from the names and addresses shown in italics.

1994

Natural products chemistry

16–20 January
19th International Symposium on Natural Products Chemistry.
Karachi, Pakistan.
Prof. Atta-ur-Rahman, Chairman, Organizing Committee, H.E.J. Research Institute of Chemistry, University of Karachi, Karachi-75270, Pakistan.
Tel: +92 (21) 470007 or 476131. Fax: +92 (21) 467887 or 466896. Telex: 28095 HEJRI PK. E-Mail: atta%hejfirst@unet.uu.net.

High-temperature materials chemistry

4–9 April
8th High Temperature Materials Conference (HTMC VIII).
Vienna, Austria.
HTMC VIII, Gesellschaft Österreichischer Chemiker, Nibelungengasse 11/6, A-1010 Wien, Austria.

Pesticide chemistry

4–9 July
8th International Congress of Pesticide Chemistry.
Washington, DC, USA.
Dr J. R. Plimmer, ABC Laboratories, 7200 ABC Lane, PO Box 1097, Columbia, MO 65205, USA.

How to apply for IUPAC sponsorship

To apply for IUPAC sponsorship, conference organizers should write to the IUPAC Secretariat (see inside back cover for address) requesting an Advanced Information Questionnaire (AIQ). Completed AIQs should be returned to the Secretariat preferably 2 YEARS and at least 12 months before the conference. Late applications will not be considered. Further information on granting of IUPAC sponsorship was published in *Chem. Intl.* **14**, 203 (1992).

Visas

It is a condition of sponsorship that organizers of meetings under the auspices of IUPAC, in considering the locations of such meetings, should take all possible steps to ensure the freedom of all bona fide chemists from throughout the world to attend irrespective of race, religion, or political philosophy.

IUPAC sponsorship implies that entry visas will be granted to all bona fide chemists provided application is made not less than three months in advance. If a visa is not granted one month before the meeting the IUPAC Secretariat should be notified without delay by the applicant.

Macromolecules

11–15 July
35th International Symposium on Macromolecules. Ohio, USA.
Macroakron'94, Cathy Manus-Gray, Symposium Coordinator, Institute of Polymer Science, The University of Akron, Akron, OH 44325-3909, USA. Tel: +1 (216) 9725334. Fax: +1 (216) 9725463. E-Mail: Manusgray@UAkron.

Chemical thermodynamics

17–22 July
13th International Conference on Chemical Thermodynamics. Clermont-Ferrand, France.
Prof. J.-P. E. Grolier, Laboratoire de Thermodynamique et Génie Chimique, Université Blaise Pascal, Clermont-Ferrand, 63177 Aubière, France.

Carbohydrates

17–22 July
17th International Carbohydrate Symposium. Ottawa, Canada.
Dr H. Jennings, Institute of Biological Sciences, National Research Council of Canada, 100 Sussex Dr., Ottawa, Ontario, Canada, K1A OR6.

Excitonic processes in condensed matters

19–22 July
International Conference on Excitonic Processes in Condensed Matters. Darwin, Australia.
Dr J. Singh, Faculty of Science, Northern Territory University, PO Box 40146, Casuarina, NT 0811, Australia.

Coordination chemistry

24–29 July
30th International Conference on Coordination Chemistry. Kyoto, Japan.
Prof. H. Ohtaki, Laboratories of Coordination Chemistry, Institute for Molecular Science, Myodaiji-cho, Okazaki 444, Japan.

Polymer networks 94

25–29 July
35th Microsymposium on Macromolecules. Prague, Czech Republic.
35th Microsymposium, P.M.M. Secretariat, c/o Institute of Macromolecular Chemistry, Academy of Sciences of the Czech Republic, 162 06 Prague 6, Czech Republic.

Physical organic chemistry

September
12th International Conference on Physical Organic Chemistry. Padova, Italy.
Prof. G. Scorrano, Dipartimento di Chimica Organica, Università degli Studi di Padova, Via Marzolo 1, 35100 Padova, Italy. Fax: +39 (49) 831222.

Liquid crystal polymers

6–9 September 1994
International Conference on Liquid Crystal Polymers. Beijing, China.
Prof. Xibai Qiu, Chinese Chemical Society, PO Box 2709, Beijing 100080, China.

Organic synthesis

11–16 December
10th International Conference on Organic Synthesis. Bangalore, India.
Prof. G. S. R. Subba Rao, (Secretary, ICOS-10), Department of Organic Chemistry, Indian Institute of Science, Bangalore 560 012, India.

1995

Toxicology and clinical chemistry of metals

10–13 July
5th COMTOX Symposium on Toxicology and Clinical Chemistry of Metals. Vancouver, BC, Canada
Prof. F. W. Sunderman, Jr., Departments of Laboratory Medicine and Pharmacology, University of Connecticut Medical School, Post Office Box 1292, Farmington, Connecticut 06034-1292, USA. Tel: +1 (203) 792328. Fax: +1 (203) 6792154.

The International Conference on Liquid Crystal Polymers will be held in Beijing, China, in September 1994.

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- to study topics of international importance to pure and applied chemistry which need regulation, standardization, or codification;
- to co-operate with other international organizations which deal with topics of a chemical nature;
- to contribute to the advancement of pure and applied chemistry in all its aspects.

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